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See thumb index. Turn to Part III on page 99. →

QUICK REFERENCE

PART I Acquaints you with what to do in general; supplies to have on hand. (Page 1)

PART II Discusses the "Big Four" at length — Asphyxiation, Bleeding, Chemical Poisoning, and Shock. (Page 64)

PART III Gives you an easy alphabetical reference to various injuries and conditions, their symptoms and treatments. (Page 99)

PART IV Deals with war injuries affecting civilians, and first-aid measures. (Page 322)

REMEMBER, this is what to do *before* the doctor comes. Write your doctor's telephone number, name and address on the opposite page. This little "memo" page will save time — which in turn may save a life!

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Telephone number_____

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WHAT TO DO TILL THE DOCTOR COMES

WHAT TO KNOW, WHAT TO HAVE READY IN THE HOME
AND HOW TO DEAL WITH SUDDEN ILLNESS
ACCIDENTAL INJURY OR WAR CATASTROPHE

A HOME MANUAL FOR EMERGENCIES

BY DONALD B. ARMSTRONG, M.D., SC.D.,
3rd Vice-President of
The Metropolitan Life Insurance Company,
with the collaboration of
GRACE T. HALLOCK

ILLUSTRATED BY BERNARD R. FRIEDMAN

SIMON AND SCHUSTER · NEW YORK
1943

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Foreword

THIS BOOK has been written as the partner—and perhaps the boss—of your family medicine cabinet. As a guide in emergencies, as a first-aid reference book, as a helpful friend to your own common sense, we hope it may find a useful place in your home—both in wartime and in peacetime.

This book is not at all the result of hasty, opportunistic "rushing into print" because of the war emergency. Work on the book was started a full year before the United States became involved in the war. We felt that it was needed then, and we feel that it is needed now more than ever.

We want, however, to make it clear that this book is not intended to replace actual first-aid instruction or as a substitute for organized methods of first-aid training. Truly effective first aid, like any other skill, can only be mastered by doing—in other words, by specific class instruction and practice. All who can are urged to secure basic training in first-aid classes, using the accepted methods and texts for such courses.

Of course we feel—or we would not have written and published this book—that you will find real use for it in addition to a first-aid course and reading, and that it will also be useful for those who have not yet been able to take a first-aid course. Because this book has been written for individual reading and home consumption, it has been possible to include much information about common illnesses as well as accidental injuries and to amplify explanations of all sorts. We have also been able to arrange a large section of the book so that it reads like a simple, giant dictionary, where any problem discussed can be tracked down and answered with a minimum of plunging about and wasted time.

THE AUTHOR
THE COLLABORATOR
THE PUBLISHERS

PART I

First Aid in General

A WORD TO THE WISE

WHEN SOMEONE is injured or suddenly taken ill, there is usually a gap between the call for medical help and its arrival, during which it may be necessary to do things to save a life—to keep a condition from getting worse—perhaps even to prevent unwise meddling. What is done is called first aid.

Enter—and Exit—the Layman

In this book the term first aid refers to the immediate, temporary care given by a layman in case of accident or sudden illness. A layman, with reference to the medical profession, is a person who is not a physician. When properly trained he can make a careful examination of an injured person, take whatever instant action is indicated to prevent death, secure expert aid, protect the victim from further injury, provide for his comfort, and arrange for his transportation when necessary. But there is a limit to what he can do —a limit defined by his amateur standing. His cue for exit is the entrance of the physician—the professional. The layman has an important part to play, however, because what he does or refrains from doing makes the physician's role just so much easier or harder to perform and the victim's condition just so much better or worse.

Be Ready!

The instant reaction to sudden disaster is fright. Cheeks turn white, the mouth becomes dry, limbs are paralyzed. For a second or two the witnesses are rooted to the spot. A physiological "knockout" of this kind is perfectly natural. It means that the body is mobilizing its forces for action. The kind of action taken depends entirely upon the individual and how much he knows. No matter how courageous or capable he may be, the impulse to *do something* may cause him to do the wrong thing or to run away or merely to wring his hands or indulge in some other equally foolish or futile action unless he knows what to do.

Knowing what to do cannot be left to the spur of the moment. Even though emergencies in particular are always unexpected, emergency in general can and should be prepared for. First-aid materials must be assembled and kept at strategic points, as in the home and in the automobile. Precise directions for getting expert help must be kept where they can be found quickly. Most important of all, many first-aid measures, such as stopping severe bleeding, giving artificial respiration, splinting fractures, bandaging wounds, and transporting the injured, must be practiced under expert instruction. Measures of this kind cannot be learned simply by reading about them, any more than a soldier can learn to fight by reading about battles, or a housewife learn to cook by reading recipes.

Of course no amount of practice in peace and quiet can completely prepare a person for the real thing—the terror, the confusion, the "blood . . . and tears." Every serious accident seems at first sight to be unique, the damage enormous. But the trained lay person who has learned the basic rules of first aid, who has practiced certain procedures until they have become automatic, who is familiar with the mistakes commonly made, is in a much better position to give first aid than is the person who has had no training. First-aid courses are now given in most communities by the Ameri-

can Red Cross. The standard textbook for these courses is the American Red Cross *First Aid Text-Book*.

The purpose of this book is to make available for ready reference information regarding a large variety of conditions that may require first aid, with reasons for the steps recommended. Various standard procedures are summarized for those who have had first-aid training and wish to refresh their memories in a hurry.

Part I is devoted to before-the-fact information so that the reader may become acquainted with what to do in general when faced with a sudden emergency, and what first-aid materials to have on hand for dealing with it. In Part II the big three emergencies—asphyxiation, bleeding, and chemical poisoning—and the problem of shock, are discussed at some length. Part III is alphabetically arranged for easy reference. When it is necessary to consult it, it is presumed that the reader has on hand or knows how to improvise the first-aid equipment required and has had training in the procedures, like splinting, bandaging, giving artificial respiration, and the like, which require practice under supervision. In Part IV various ways in which civilians may be injured by enemy action are described together with the first-aid measures recommended.

WHAT TO BE READY FOR

BETTER even than knowing how to give first aid would be knowing how to prevent all accidents. But apparently there is no completely safe place in which to put a human being, and apparently there is no human being who is completely accident-proof. The nearest anyone ever came to it was Achilles, and even he had his weak spot. The human body is extremely vulnerable on the outside to forcible impact with hard things, sharp things, and hot things, and to the presence on the inside of things swallowed or breathed which interfere with the work necessary to maintain life. Thus it is quite easy to crush, break, puncture, burn, or poison human beings unless they use their brains to make up for their vulnerability.

Successfully pitting the brain against damage to brawn would mean, *first,* recognizing all unsafe conditions and removing them, and, *second,* learning the right way of doing everything that needs to be done and then doing it that way, forsaking all others. It is safe to say that if everyone kept everything in order and in its proper place and did everything in the right way we should come close to bringing true the dream of things as they ought to be in the realm of accident prevention. In this book, however, we are looking at things as they are.

Almost 100,000 persons are fatally hurt every year in accidents, more than 325,000 are permanently disabled, and nearly 9,000,000 receive temporary injuries. Those who are killed outright are, of course, beyond help. But many of the survivors die later or are crippled for life simply because no

one happened to be on the spot who knew the right thing to do. Thus the third way in which we may use our brains to protect brawn is to be ready to minimize the effects of accidents whenever and wherever they occur, by learning how to give first aid.

The Kinds of Things That Happen

Using accident statistics as a guide, the major injuries most commonly incurred are wounds and broken or crushed bones. The reason for this is that automobile accidents and falls have been responsible for most serious and fatal injuries.

The next most common type of injury is burns (including scalds) of which carelessness or ignorance in the use of matches is a prime cause.

Asphyxiation by drowning, inhaling toxic vapors, or mechanical suffocation is the third ranking cause of accidental death. Asphyxiation means oxygen starvation. It takes only a very little while to die after the oxygen supply of the body cells is cut off.

Swallowing a poisonous substance, usually by mistake but occasionally with suicidal intent, comes last on the list of major catastrophes with which we may be called upon to deal.

Although serious wounds, broken or crushed bones, extensive burns, asphyxiation, and poison swallowed are the front-ranking emergencies, they are by no means the only ones that call for first aid. There are all sorts of ways of hurting the human body which may or may not have serious consequences according to the way in which the resulting injuries are cared for. By and large, these so-called minor injuries and conditions—the skinned knees, bruises, nosebleeds, cinders in the eye, ivy poisoning, scratches, pinpricks, little cuts, blisters, sprains, strains, and all the rest—are the only ones, barring enemy invasion, with which the majority of people in the United States will ever have to deal. Yet

knowing how to deal with them properly may lessen discomfort, shorten the period of disability, even prevent death.

As surgeons found out long before the era of asepsis, a pinprick quite literally may be a "door open to death." A tiny break in the skin is as spacious a gateway to destructive bacteria as is the Biblical gateway open to human sinners bent on destruction. Victims of severe sunburn and ivy poisoning are not as a rule in serious danger, but "uncomfortable" is too mild a word to describe their sufferings. A sprain may result in a weak ankle for life if it is not tended to properly. "Something in the eye" may lead to serious eye injury or infection if attempts to remove it are bungled. Thus although first aid, strictly speaking, refers to the temporary handling of major injuries or sudden illnesses, it covers also the so-called "common" mishaps which practically everyone everywhere meets with at one time or another.

In Case of Illness

Relatively few conditions due to illness, as opposed to accidental injury, require first aid. Among them are convulsions, hemorrhage from the lungs or stomach, unconsciousness as in an apoplectic stroke, insulin shock, the onset of diabetic coma, and extreme shortness of breath or agonizing pain as in a heart attack. The first-aid measures to take before the doctor comes, in emergencies of this kind, are described in Part III.

In most cases of beginning illness, the only action necessary for the layman to take is to put the sick person to bed in a room by himself and to keep him warm and as comfortable as possible until the doctor arrives. Isolating the person is important, particularly if he is a child, as he may be coming down with a communicable disease. Usually a communicable disease in the early stages is even more contagious than in the stage when the characteristic signs appear.

Signs and Symptoms

Indications of illness are spoken of as signs and symptoms. To a physician signs and symptoms are what fingerprints are to a G-man. By them the physician identifies a disease and tells it apart from any number of others that may resemble it.

The layman may and should learn certain danger signals so that he will know when a doctor should be called and what information he should be prepared to give the doctor. But to decide for himself what is wrong and to administer the treatment he thinks is indicated are likely to have disastrous consequences. Many a case of appendicitis has been mistaken for a "green-apple" stomach-ache, for example, and many a case of pneumonia has been labeled in the beginning as "just a cold."

A sign of disease is any departure from normal which is apparent to an observer. Thus, flushed cheeks, coughing and sneezing, watery eyes, an air of listlessness or fatigue, vomiting, and refusal to eat are all objective, "eyewitness" evidence of something wrong. Signs of this kind are typical of the onset of many of the communicable diseases of childhood. On the other hand, pain, nausea without vomiting, feeling tired or chilly, feeling "sick all over," are symptoms —feelings of which the sufferer can give a circumstantial account but which may or may not leave imprints visible to an observer.

Symptoms may be compared to hearsay evidence which is not admitted in a court of law without some sort of concrete evidence to back it up. The physician can produce the evidence if bacterial invasion or something organically wrong is causing the symptoms, because he is trained to see, hear, and feel objective signs which would not be noticed by a layman and also because he is trained to interpret the evidence of disease which can be detected only by the use of instruments and various tests.

Although a medical examination is by no means infallible, it does serve as a screen to sift the evidence gleaned by the physician from the patient's own story and appearance. In the great majority of cases it leads to a correct verdict. Periodic medical examinations are valuable, because in many cases objective evidence of beginning trouble is obtained even when a person neither feels nor looks ill. Early detection of any departure from normal makes it much easier for a physician to get his patient back to normal if that is possible.

When To Call the Doctor

To call or not to call a doctor when an illness seems slight is often a difficult question to decide. Some conditions that seem trivial may actually be trivial and clear up by themselves. On the other hand, a serious illness may begin with only mild signs and symptoms. In that case, delay in getting medical attention may result in spreading a communicable disease, or in prolonging the illness, or even in death.

In general the "red lights" that mean a doctor should be consulted promptly as a form of insurance against possible serious consequences are as follows: a sore throat; a skin rash; a "cold" with chilliness, fever, and aching; a persistent cough; persistent or severe abdominal pain; any lump, swelling, or sore which does not promptly disappear; any mole or pigmented area of the skin which starts to enlarge or ulcerate; any abnormal discharge; any persistent signs or symptoms associated with being below par—for example, tiring easily, a poor appetite, loss of weight without obvious cause, shortness of breath on slight exertion, frequent headaches, and dizziness.

How To Call the Doctor

When we make up our minds to call a doctor, we usually want him to come as soon as possible. If the doctor is not in when the call comes, it is impossible for him, when he

returns to his office, to know whether he is wanted for a real emergency like a hemorrhage, convulsions, a shaking chill with difficult breathing, or severe abdominal pain, or whether there is no need for great haste in reaching the patient. It would help the doctor and insure prompt medical aid when it is needed if everyone in calling the doctor would remember:

First, to use the words *very urgent* in case of a real emergency, together with a brief description of its nature.
Second, to refrain from urging haste when none is necessary. Patients who are in the habit of crying "wolf" when none is in sight may fail to get a busy doctor promptly when the "wolf" finally arrives.

WHAT TO DO—IN GENERAL

A PERSON trained in giving first aid should immediately take charge when someone has been injured or is taken suddenly ill. This may require tact, but usually other witnesses are only too glad to obey the orders of someone who has the air of knowing what to do.

At First Sight

The first thing that will meet the eye is the location of the injured person. Unless his safety is jeopardized by leaving him where he is, it is best not to move him to another place until the arrival of a doctor or an ambulance. Hurriedly rushing the victims of automobile accidents to the doctor or a hospital has resulted in many deaths and permanent injuries.

In most cases, the best position for the victim is lying down with the head level with the rest of the body. The victim's head may be raised slightly if his face is flushed or there is bleeding from the head. If the victim vomits, his head should be turned to one side to keep him from choking.

Handle with Care

The first step to take is to determine the nature and extent of the injury without moving the injured person more than is absolutely necessary. It is especially important to use extreme care in handling the victim of a fall, an automobile accident, or any other accident in which bones may have

been broken or internal injuries sustained. Making an injured person sit up or stand up for examination or just to see if he can do so, and shaking or slapping an unconscious person to "bring him to," are mistakes commonly made by bungling amateurs. In moving an injured person without taking proper precautions, the end of a broken bone may be pushed through the skin, or the spinal cord may be damaged, or some other bad matter may be made much worse.

Take Your Time

It is very important to make a judicious and careful examination. If the victim is conscious he should be encouraged to tell where he has been hurt. The inexperienced first-aid worker is sometimes tempted to hurry through the examination or to note only the obvious injury, and fail to search for others which may be even more serious. If clothing covers any part of the body where injury is suspected because of the victim's story or because of objective evidence, like blood soaking through a sleeve or a pants leg, it is necessary to remove it in order to determine the nature and extent of the injury. Slit seams if possible; if not, do not hesitate to cut the cloth. To remove a shoe, slit the back and cut the laces. Unless the emergency is extreme, work with deliberation. Do not let yourself be heckled by bystanders. Remember that a good examination requires time and tact.

Be Ready To Save a Life

The big three emergencies in which instant action must be taken to prevent death are severe bleeding, stoppage of breathing, and poison swallowed.

Look out for shock. Shock is present in practically all serious injuries and in many minor ones. In general, shock is the outcome of a sudden depression of all the activities of the body. It may be slight and transient (primary shock) or profound and even fatal (secondary shock). A person suffering from secondary shock is very pale and cold, his pulse

weak and rapid, and his breathing irregular. He may seem listless and stupid or, if bleeding profusely, restless and excited. The physiological reactions and first-aid care of a person in a state of shock are discussed in Part II.

Keep the Victim Warm and Quiet

Keeping an injured person warm and lying flat will help to prevent or minimize shock. Put a coat or blanket under him as well as over him. If he is conscious and there is no head injury, severe bleeding, or suspected internal injury, give him a stimulant such as aromatic spirits of ammonia or hot, sweetened coffee or tea. Do not give him whisky or brandy or any other alcoholic drink.

Usually it is possible to tell whether or not an injured person is conscious by talking to him. If he is conscious he is able to answer questions and to tell where he is hurt. *If he is unconscious, under no circumstances* should water or stimulants be poured into his mouth. If he cannot take a drink voluntarily, the chances are that he cannot swallow either, and the liquid may enter his windpipe and strangle him.

Allay Fear

Do everything possible to allay the fears of the injured person and to make him as comfortable as can be done with safety. Do not allow him to see his injuries if this can be avoided, and do not talk about them. Be kind and gentle, calm and confident, as you would be in dealing with a sick or hurt child. If the injured person is very badly scared—by a hemorrhage from the lungs or stomach, for example—you are justified in giving reassurement.

Handling the Crowd

Unless an accident happens at home or in an isolated spot, a crowd usually gathers at the scene with the sticky persistence of flies around a honey pot. "Stand back! Give him

air!" has become in the common mind the shibboleth of the genuine first-aider. If he does not speak words to that effect, his competence may be questioned. In any event, it is a command that usually secures elbowroom in which to work, and may squelch well-meaning interference. Usually there is tremendous pressure that something be done; but do not be stampeded into doing something because action is demanded. Doing nothing except to keep the victim warm and quiet is often the only correct procedure.

A good way to handle a crowd is to give it something to do. Although most people are curious, they really are not ghouls and usually are eager to help. Someone may be sent to summon a physician or an ambulance and to notify the police. Another may be commissioned to notify the victim's relatives or friends without unduly alarming them. Others may handle traffic until the police arrive. If it is imperative to move the victim, some bystanders may get the necessary equipment and undertake the job under the supervision of the person in charge (see Transportation of the Injured, page 275). If immediate rescue from a dangerous situation is required, volunteers may be called upon for help and instructed in the proper measures to take.

HOW TO GET HELP

According to the laws of chance, a place where people collect in large numbers for any length of time is bound sooner or later to be the scene of an accident. In places of this kind —bathing beaches, fair grounds, factories, mines, schools, hotels, department stores, and so on—expert help usually is planted to deal with emergencies. But in and around individual homes and in places where people usually are just passing by, as on streets and highways, or stopping for a picnic or a swim—in all places, that is, where people are more or less on their own so far as getting help in case of need is concerned, it is rare indeed that expert aid is on hand. Knowing what kind of help to get and how to get it will save valuable minutes.

Practically everyone knows whom to call when someone is hurt or when the house catches fire or when murder is done. Not everyone knows, however, that the fire department and the police department have "rescue squads" equipped to extricate people (and animals) from dangerous situations and to revive people who have stopped breathing because of gas poisoning, electric shock, or suffocation from drowning, smothering, strangulation, or choking. Public-utility companies also have emergency cars to handle accidents involving gas leakage, gas asphyxiation, and electric shock.

Police patrol cars in cities and on highways are equipped with radios so that they can keep in touch with police headquarters. When notified of an accident they often are the first to arrive on the scene. In most states, highway-patrol

officers or the state police are trained in giving first aid and carry the necessary supplies in their patrol cars or on their motorcycles. In all accidents that require investigation to fix responsibility the police must be summoned at once.

At strategic points along well-traveled highways in many sections the American Red Cross has established first-aid stations from which a physician may be summoned to the scene of accident. People living in the vicinity of such a station should know where it is located and how to notify it quickly in case of need.

Telephone operators are trained to handle emergencies and may be depended upon to summon help if the person calling cannot remain at the telephone. It is necessary only to tell the operator exactly where help is needed and what kind of help is wanted—doctor, firemen, or police.

A Telephone Emergency List

It is difficult even for a naturally calm person to remember telephone numbers in the flurry following an accident. Besides, the naturally calm person might not be at home. A child or a neighbor or a comparative stranger might have to do the necessary telephoning for help. For that reason an emergency telephone list should be posted near the telephone in every home. If the home does not have a telephone, the list should be posted in some spot known to all the members of the family who can read. The list should contain the following information:

Family Doctor
Name .....
Address .....
Telephone number .....

Another Doctor in the Neighborhood
Name .....
Address .....
Telephone number .....

Nearest Drugstore
Address .....
Telephone number .....

Fire Department
To report a fire by telephone, dial or call the operator.
Location of nearest fire-alarm box .....

Police Department
To summon the police by telephone, dial or call the operator.
Address of nearest police station .....

Gas and Electric Company
Address of nearest office .....
Telephone number .....

Where and What?

In calling a physician or ambulance be prepared to give (1) the location of the injured person; (2) the cause, nature, and extent of the injury, so that the physician will know what supplies and equipment to bring (as, for example, the antidote for a poison or traction-fixation splints for a broken leg); and (3) what first aid is being rendered, so that the physician can suggest further measures that he may think advisable.

In calling for help from the police department, fire department, or gas and electric company, describe the nature of the emergency and give the location of the place where help is wanted. A surprising number of people forget in their frenzied cry for help that fires and accidents as well as letters may become lost without a clear address.

Every adult and older child in the home should know the location of the first-aid book and the first-aid cabinet. At least one approved fire extinguisher should be kept in a convenient location, and every adult and older child should know where it is and how to operate it. There are different

kinds of fire extinguishers for use on different types of fires. The label on the fire extinguisher tells what kinds of fires it will put out. Before purchasing a fire extinguisher it might be well to consult the local fire department, the local representative of a fire-insurance company, or your air-raid warden as to the type of fire extinguisher recommended for home use. Most fire extinguishers must be recharged from time to time whether they have been used or not. The dealer from whom the extinguisher is purchased will tell you how often this should be done. (See also Appendix, page 353, on the use of fire extinguishers in extinguishing incendiary bombs.)

Who Are You?

It sometimes happens that a person is injured or taken suddenly ill away from home without possessing any means of identification. If the victim is unconscious or loses his memory, it may be some time before his relatives or friends can be notified. To avoid this contingency everyone should wear on his or her person an identification card giving the following information:

Identification Card

Name .....
Address .....
Doctor's name, address, and telephone number .....
.....
.....
The name, address, and telephone number of the individual to be notified in case of accident or serious illness .....
.....
.....

(If a person is a diabetic or an epileptic, information to that effect should be given on the identification card.)

As a sure means of establishing identity in case of war-

time emergency, the police department in many communities is urging the fingerprinting of all residents so that each individual's fingerprints may be recorded both on his identification card and on an identification-record form kept at police headquarters.

WHAT TO HAVE READY

FIRST-AID SUPPLIES may be classified in two groups: (1) those which are to be applied to the outside of the body—for example, materials required for the first-aid care of wounds and burns, stopping bleeding by pressure, and protecting broken bones until they can be set properly; and (2) those which are to be given by mouth, as indicated in various types of first-aid care—for example, stimulants.

The Home First-Aid Cabinet

First-aid supplies kept in the home should be carefully selected and kept in a cabinet or special box reserved for the purpose. The cabinet or box should be placed in a convenient location and well out of reach of small children. If the medicine cabinet is used for loose first-aid materials, definite shelves or compartments should be set aside for their storage.

The principal thing to emphasize about the household first-aid cabinet is that it should be kept spick and span and completely equipped at all times. First-aid materials always should be returned to the cabinet after use and not left about the home or on various shelves in the bathroom as so often happens. Each article should have its own place. Bottles, boxes, and packages scattered hit and miss on the shelves of a cabinet or jumbled in a box cannot be found quickly when needed, and sometimes serious mistakes may be made in the selection of drugs.

The contents of the cabinet should be checked from time to time. It is very disconcerting in an emergency to find that all the iodine is gone, for example, or that the sealed package containing the last sterile compress has been broken, or that the ice cap is missing.

All supplies that would cause poisoning when taken internally—for example, rubbing alcohol and iodine—must be labeled poison and kept on a special shelf or in a special

compartment. They should be distinguished by some sort of device, such as a pin stuck into the cork of a bottle or sandpaper about a box, to prevent mistakes when selecting first-aid materials in a hurry or at night.

In the following discussion of first-aid materials, the supplies in each category which are recommended for the home are listed at the beginning of each section. Quantities to be purchased depend upon the size of the family.

FIRST-AID DRESSINGS

First-aid dressings consist of sterile compresses, bandage material, splints, and tourniquets.

Sterile Compresses—Each in a Sealed Envelope

Sterile one-inch gauze compresses on adhesive tape.
Sterile bandage compresses in assorted sizes.
Folded pieces of sterile gauze, one square yard when unfolded.

A compress is a pad of sterile material to be placed directly over a wound or burn. It should be large enough to cover the skin for at least a half inch beyond the borders of the injury and should be several layers thick. The compress must be sterile in order to guard against the further infection of accidental injuries like wounds and burns in which the skin or mucous membrane has been broken.

Infection is caused by "germs," the majority of which belong to the family of microscopic plants called pathogenic (disease-causing) bacteria. In general, each kind of bacterium produces specific effects in the human body, just as each kind of seed when planted in the earth develops into a specific kind of plant. A tetanus bacillus could no more produce pneumonia than lettuce seed could produce radishes.

There are round bacteria like balls, straight ones like sticks, and crooked ones like corkscrews. There are big, middle-sized, and small bacteria. Some are capable of causing more trouble than are others. Some thrive in the dark,

others need light; some need no oxygen, others cannot live without it. Some need lots of water, others very little. Some can grow only on special tissues or flesh, others are not so fastidious. But most of them, fortunately for us, can be destroyed by heat or chemicals.

The importance of germ-killing heat in first aid lies in the fact that it can be used to destroy germs on or in materials used in dressing and cleansing breaks in the skin. Material which has been completely freed of germs is called sterile. Thus we speak of sterile gauze, sterile water, a sterile solution, and sterile instruments.

Sterile material becomes nonsterile (contaminated) when it is touched with the fingers or any object not sterilized. Hence, in unfolding or unrolling a compress great care must be taken to avoid touching the surface of the gauze that is to be placed directly in contact with the wound.

Small pads of sterile gauze on strips of adhesive tape to hold them in place are suitable for covering minor cuts and scratches. They may be purchased in any drugstore. Each compress is sealed in a waxed-paper package and is used to cover a single small injury. The adhesive is protected with a covering of crinoline which must be pulled off before the compress is applied.

A satisfactory compress for covering larger open wounds consists of a pad made of several thicknesses of sterile gauze sewed to the middle of a strip of muslin. A compress of this kind is called a sterile bandage compress (see Figure 1).

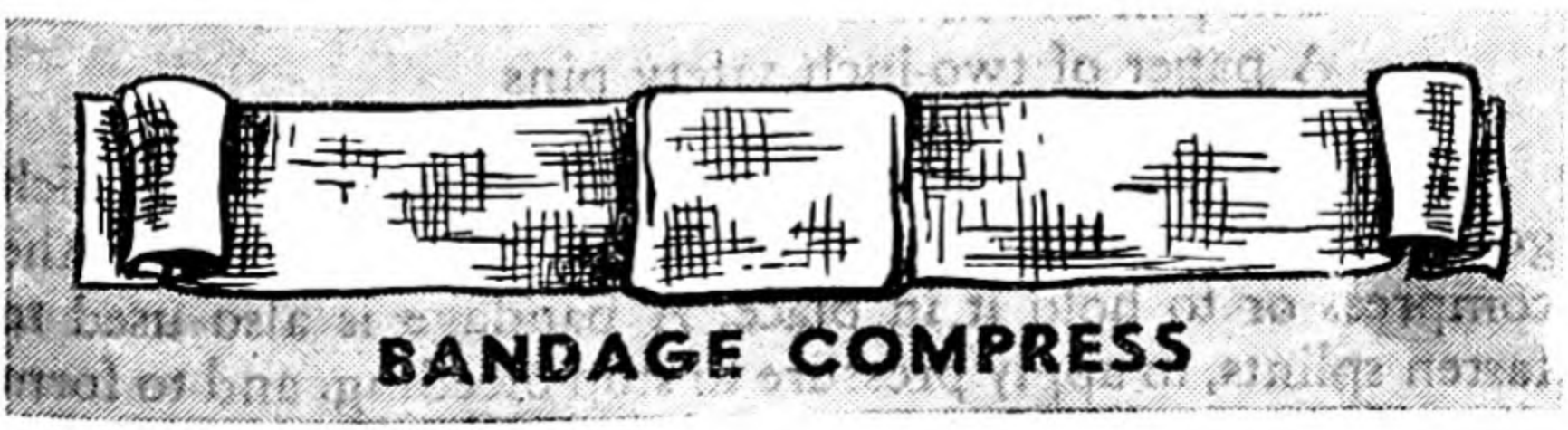

Figure 1

Ready-made bandage compresses in sealed packages may be purchased in a drugstore in assorted sizes, small, medium, and large. Usually the gauze pads may be unfolded to twice their size by ripping stitches on one side. The bandage tails on each side of the gauze pads are folded back, and can be opened up without touching the sterile pad which goes next to the wound.

Compresses large enough to cover extensive wounds consist of gauze squares several layers thick sealed in waxed-paper wrappers. They are held in place by short strips of adhesive tape or by triangular, cravat, or roller bandages (see pages 23-24).

An important point to remember about a sterile compress is that its sterility is destroyed when the package is opened. Also, sterility may not be maintained in packages kept for a long time. For that reason it is wise to replace unused compresses occasionally.

Gauze that has lost its sterility, or any other kind of cloth used to cover a wound, may be sterilized immediately beforehand by scorching it with a hot iron. In an emergency, cloth may be sterilized by scorching it over an open flame.

Bandage Material

Sealed packages of one-inch and two-inch gauze roller bandage
Triangular bandages
Rolls of one-inch and two-inch adhesive tape
One pair of scissors
A paper of two-inch safety pins

The bandage, as distinct from the sterile compress which goes directly over a wound or burn, is used to cover the compress or to hold it in place. A bandage is also used to fasten splints, to apply pressure to stop bleeding, and to form slings.

Adhesive tape can be used to anchor small compresses, but

it is important to remember that adhesive tape, court plaster, collodion ("new skin") or any similar material never should be applied directly over a wound, principally because it seals the wound so that air cannot reach it. Some dangerous bacteria (notably the kind which causes tetanus, or lockjaw) thrive in the absence of oxygen.

There are two general types of bandages and each one can be used to make another kind—the triangular bandage which becomes the cravat bandage when it is folded repeatedly on itself (see Figure 2), and the roller bandage which becomes the four-tail bandage when it is slit from each end toward the middle.

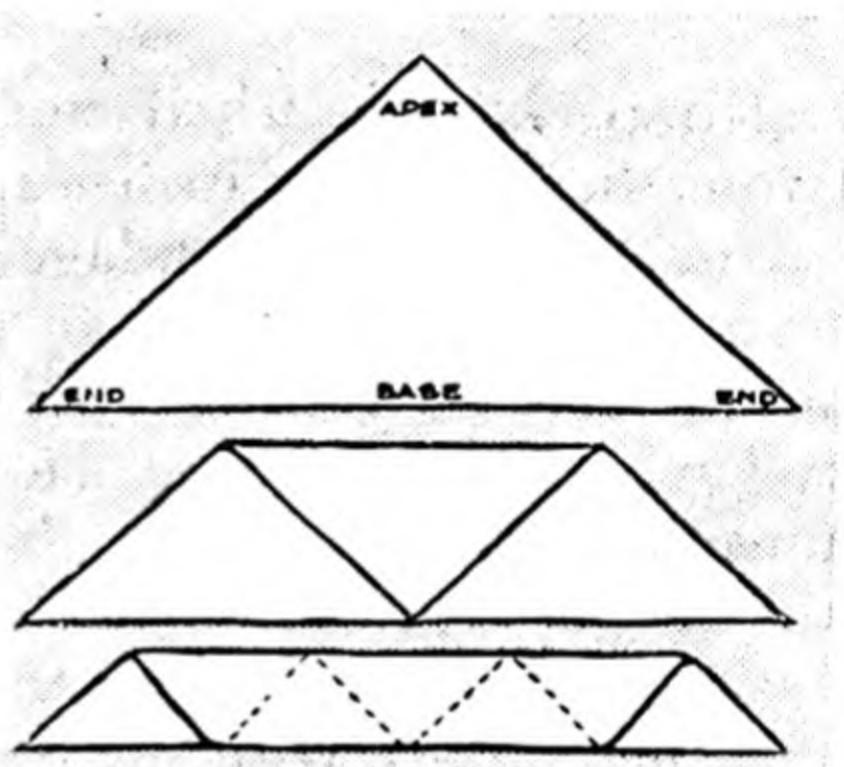

Figure 2. To make a wide cravat bandage from a triangular bandage, bring the apex of the triangle to the center of the base. To make a medium cravat, fold the wide cravat lengthwise along a line midway between the top and the base. Repeat the folding operation to form a narrow cravat.

The triangular bandage is by far the most useful of all bandages for first-aid work and also the easiest to improvise. It can be purchased ready-made from a drugstore or made at home from a square of any kind of cloth such as unbleached cotton, linen, or gauze. Two triangular bandages may be made by folding the square diagonally and cutting along the fold. Or the square may be folded diagonally to make a single triangle two layers thick. A 24-inch, 36-inch, or 40-inch square is employed to make triangular bandages according to the size desired. The standard size is made from a 40-inch square.

A roller bandage consists of a strip of material of any width or length rolled up on itself to form a compact roll (Figure 3a). Gauze roller bandage may be purchased in a

a b

Figure 3

sealed package marked sterilized in widths of one inch, two inches, and four inches and in lengths of from five to ten yards. Also a roller bandage can easily be made from strips torn or cut from a piece of gauze, muslin, linen or from a sheet, tablecloth, skirt, and so on. To roll the strip into a roller bandage, fold one end repeatedly on itself for a distance of eighteen inches, then roll the folded portion with the finger and thumb until a tight cylinder is made. The easiest way to complete the roll is to place the cylinder on a flat surface with the free end of the strip trailing away from you. Then gently pressing the cylinder with the fingers, push it in the direction of the free end of the strip, thus rolling the bandage.

A sterile roller bandage or a long strip of sterile gauze folded or pleated so that it lies flat in a rectangular package is often used to make wound compresses as well as for bandaging. It is important to remember that gauze roller bandage will no longer be sterile on the outside after the package has been opened. It must be unrolled two or three turns and the unrolled part cut off in order to reach a fresh sterile surface. This makes for waste and also leaves open a loophole for possible contamination. For that reason, indi-

vidual sterilized compresses are the safest and most economical compresses to purchase.

The four-tail bandage is made from a strip of muslin, linen, or gauze by tearing or cutting it down the center from each end for about one third the length of the entire strip (Figure 3b).

The circumstances under which different types of bandages are used and methods of applying are described under Bandaging (pages 105-122), in Part III.

Tourniquet Material

Stoppage ot severe bleeding takes precedence over all other measures in the first-aid handling of wounds. In most instances bleeding can be stopped by pressure on the appropriate pressure point (see pages 75-79) or directly over the compress covering the wound. But in some cases it is necessary to apply a tourniquet to check severe bleeding. A tourniquet may be purchased ready-made from a drugstore, but if one is not at hand any fairly wide, flat band long enough to go twice around the limb will serve. A cravat bandage made from a large handkerchief, a necktie, stocking, or strip of cloth torn from the clothing may be used. Do not use cord, rope, or wire. Directions for applying a tourniquet are given on pages 80-83.

SPLINTS

Splints are appliances made of stiff material used to support and protect a part of the body in which a bone has been fractured or dislocated and to prevent movement at the point of the fracture and also of the joints above and below it.

Splints must be long enough to prevent movement of the joints above and below the fracture and as wide as, if not wider than, the part for which they are intended. They must be padded on the inner side and at the ends where they come in contact with the body. They may be held

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in place by roller, cravat, or triangular bandages; strips of clothing, neckties, belts, and the like.

Splints made of yucca, basswood, wire mesh, or similar light, rigid material may be purchased for the first-aid kit or cabinet. If these are not available, splints may be improvised from any suitable material at hand—for example, pieces of packing boxes, shingles, folded newspapers or magazines, pillows or blankets, heavy cardboard, barrel staves, umbrellas, fence boards, stakes, tree branches, paddles, tent poles, skis or ski poles, and the like.

SUPPLEMENTARY SUPPLIES USED IN APPLYING FIRST-AID DRESSINGS

A package of sterile absorbent cotton
Toothpicks for making cotton swabs
A tube of soap solvent or a bottle of tincture of green soap
A three-inch forceps (splinter forceps or tweezers)
A two-ounce bottle of mild tincture of iodine (2% solution) with a glass or rubber stopper, or several iodine ampoules
A pint bottle of 70% alcohol
Four ounces of boric-acid crystals or a one-pint bottle of saturated boric-acid solution
One square foot of picric-acid gauze in a sealed package
A large tube of tannic-acid jelly
A four-ounce box of sodium bicarbonate or a box of baking soda
A tube of boric-acid ointment
A tube of sterile petrolatum (vaseline)
A small tube of sterile castor oil or sterile mineral oil
An eyedropper

The materials listed above are those commonly recommended for use in caring for minor injuries in which the skin has been broken or burned. As other disinfectants or antiseptics besides those mentioned are sometimes used, brief descriptions of the manner in which they act are included in the following section.

Materials for Cleansing Wounds

As a general rule, the cleaning and disinfecting of all serious wounds must be left to the doctor. However, the little shallow cuts, abrasions, scratches, broken blisters, superficial splinters, and so on which we have always with us, especially if there are children in the home, may in most instances be handled safely by a layman.

Soap, water, and pads or swabs of sterile cotton may be used to free a minor skin injury and the skin around it from visible dirt. Some authorities do not advocate the use of soap and water for fear that more germs will be washed into the wound than out of it. However, soap has a germicidal action against a number of pathogenic organisms, and soap and water are practically always available in the home. Tincture of green soap is best, but soap solvent in a tube, or even cake soap, will do. The water used should be sterile if possible. Water is sterilized by boiling from ten to twenty minutes and then left to cool in the covered vessel in which it was boiled. If not practicable, clean running water, preferably from the hot-water tap, may be used. It must be remembered that cleansing with soap and water is not disinfection. Any surface is clean surgically speaking only when it is aseptic, that is, free from germs. The procedure to be followed in cleansing a minor wound is described in Part III, pages 317-318.

Splinter forceps or tweezers may be used to remove superficial splinters and to pick bits of visible dirt from a wound or abrasion. All instruments used in first-aid work must be sterilized before use. This may be done by boiling them for from ten to twenty minutes. When the tip (or tips) of an instrument such as a needle, knife, or tweezers must be sterilized in a hurry, it can be done effectively by pouring a few drops of alcohol on it and setting it aflame, or by holding it in the flame of a match. Wipe off the carbon with a *sterile* bit of gauze or cotton—*not* on an unsterile handkerchief or any other unsterile cloth or paper.

Germicides and Antiseptics

Chemical disinfection is used in first-aid work to kill bacteria in minor wounds and to disinfect the skin before penetrating it as in removing a splinter. The chemicals used are classed as germicides or disinfectants and antiseptics. A germicide is literally a germ-killer, and swiftness of execution is its specialty. In contrast to the rapid-fire action of germicides, antiseptics achieve their work of destruction by inhibiting or slowing up the growth of germs. Since rapid multiplication is the principal maneuver by which invading germs maintain a foothold in the body and eventually overwhelm its natural defense forces, any substance which can check multiplication of the invaders is of immeasurable help to the defenders. In everyday speech, the terms germicide, disinfectant, and antiseptic are used interchangeably.

Alcohol. The most ancient germicide is alcohol. Wine has been used to treat wounds since the days of ancient Greece. The substitution of filthy oils and salves for wine was one of the reasons for the appalling record of wound infection from the late Middle Ages to the beginning of modern surgery.

Alcohol diluted with water is now a favorite germicide for disinfecting wounds, the skin, and also instruments, such as surgical tools, which cannot be sterilized by heat. A 70% solution (seventy parts alcohol to thirty parts water) gives the maximum germicidal action. In weak solutions (less alcohol and more water) alcohol has only a mildly antiseptic action. Solutions containing more than 80% alcohol and even absolute, or water-free, alcohol have little effect on bacteria. The reason for this is that alcohol penetrates the cell walls of bacteria more readily in the presence of water. Many substances which are antiseptic in water are not effective when dissolved in absolute alcohol because they are not ionized (separated into atoms having a charge of positive or negative electricity).

Acids. Certain acids also have germicidal action. The acid

of vinegar—acetic acid—was used to dress wounds long before it was known why it worked. When Jack "broke his crown," you will remember, vinegar on brown paper was the first-aid remedy used.

The acid most frequently employed in first-aid work is boric or boracic acid. It is made by treating borax with hydrochloric acid. A solution of boric-acid crystals and sterile water is used to wash delicate tissues such as the eye, in a dilution so weak that its action is only mildly antiseptic rather than germicidal.

A saturated solution of boric acid is nonirritating and sterile and is useful for cleansing wounds, for removing dressings that stick, and for making moist dressings. To make a saturated solution, as much boric-acid powder or crystals as possible should be dissolved in warm sterile water (about five teaspoonfuls to a pint of water). As the solution cools, excess crystals will fall to the bottom of the container. If crystals are not present, the solution is not saturated. A pint of saturated boric acid can be kept on hand in a stoppered bottle in the home first-aid cabinet.

The Phenol Group. Carbolic acid, the mother of the phenols, is a coal-tar product which chemically is not an acid but an alcohol. It has the honor of being the disinfectant chosen by Joseph Lister in his first demonstration of antiseptic surgery. However, it is no longer applied directly to wounds because of its irritating and toxic effect on living tissue. In a 2½% aqueous (water) solution it may be used to disinfect the hands and unbroken skin, and in a 5% solution to disinfect instruments when heat-sterilization is impractical.

Chlorine and Iodine. Among our most powerful germicides are the closely related chemical elements, chlorine and iodine, and their compounds and solutions. They act vigorously to destroy bacteria in wounds in the first few minutes after application and then are neutralized by the body proteins present. Chlorine is the effective ingredient in Dakin's

solution invented by B. D. Dakin, a New York chemist, during the First World War. Dr. Alexis Carrel, who was associated with Dakin, devised a way to use this solution in the continuous irrigation of wounds. This method of wound treatment has saved thousands of lives.

Bleaching powder, otherwise known as chloride of lime, gives up chlorine when exposed to air or moisture. Chlorine reacts with mustard gas, a skin-blistering agent used in chemical warfare, to destroy it. It is thus very useful in preventing skin burns after contamination with mustard gas and other skin-blistering gases (see pages 333, 339-341).

Iodine has stood the test of time as one of the safest and most effective germicides available. The tincture of iodine now recommended for first-aid use consists of a 2% solution of iodine in alcohol. Ordinary tincture of iodine sold in drug-stores is too strong. In purchasing iodine, be sure to ask the druggist for mild tincture of iodine. A bottle containing iodine should have a glass or rubber stopper and should be kept tightly closed. Otherwise the alcohol will evaporate and the iodine will become too strong. Many kinds of iodine bottles have a glass applicator attached to the stopper for applying the iodine. If an applicator is not furnished with the bottle, a swab made by twisting clean cotton around the end of a toothpick, wooden applicator, or match may be used.

To make the swab: (1) grasp a bit of cotton, pulled thin, between the thumb and forefinger of one hand; (2) lay the tip of the stick on the cotton, and with the thumb and fore-finger of the other hand twist the applicator around and around until the cotton is firmly and smoothly attached to the end of the stick.

Glass ampoules (small sealed glass tubes) of tincture of iodine may be purchased for first-aid kits. They are easy to carry and evaporation cannot take place. Each ampoule usually has a swab on the end or a small glass rod inside for applying iodine to a wound.

Care must be taken in the use of iodine, since it may burn the tissues if too much is used. Never pour iodine into a wound directly from the bottle. Always wait until the iodine is dry before covering the wound with a compress.

Salts of Heavy Metals. Certain metallic compounds make very effective antiseptics. The most familiar are compounds of mercury and silver. Mercury first won fame as an antiseptic in the sixteenth century, when it was found to be useful in checking the ravages of syphilis.

Bichloride of mercury, or corrosive sublimate, is a deadly poison both for germs and for any unfortunate human being who takes it by mistake. To prevent accidental poisoning, bichloride of mercury tablets are colored blue and are angular in shape to distinguish them from tablets for internal use.

One tablet of bichloride of mercury in a pint of water makes a 1-to-1000 solution for disinfecting the outside skin and hands. Because it is very poisonous it is not safe for laymen to use in the first-aid care of wounds.

Mercurochrome is a complex compound of mercury and a dye called fluorescein. It occurs as iridescent green scales and dissolves readily in water and alcohol. A 2% aqueous solution is frequently used in the treatment of minor wounds and cuts. It leaves a red stain on the skin and fabrics, which may be removed by a 2% solution of potassium permanganate. Children prefer mercurochrome to iodine because it does not "sting." However, as it is only a moderately active antiseptic, it is safer to stick to iodine in caring for cuts, scratches, and abrasions which will not be treated by a physician.

Silver nitrate is the most familiar silver compound. It occurs as colorless crystals which turn gray or grayish black when exposed to light. When dissolved in water, the crystals are highly efficient as a germicide. The doctor puts a 2% solution of silver nitrate in the eyes of a newborn infant to prevent the development of an infection which often results in blindness.

Oxidizing Germicides. Certain chemicals destroy bacteria by liberating free oxygen when they combine with the protein in living tissue. The most familiar are hydrogen peroxide, which bubbles when it is poured on a wound, and potassium permanganate, the beautiful purple fluid which turns an ugly dark brown when it comes in contact with the tissues. Hydrogen peroxide is effective as a germ-killer only when the freed oxygen comes in direct contact with types of bacteria killed by oxygen. As it is difficult to establish this contact in all the nooks and crannies of a wound, it is not wise to place too much confidence in hydrogen peroxide as a disinfectant, although it is useful in the preliminary cleansing of wounds. Hydrogen peroxide is very unstable and must be fresh and kept in a colored bottle.

Potassium permanganate also decomposes and liberates oxygen in contact with living tissue. It is used in aqueous solutions of varying strengths for many different purposes—for example, as a deodorant wash in diseases and wound infections in which offensive discharges occur, as a stomach wash in certain cases of chemical poisons swallowed, and as a wet dressing in cases of ivy poisoning. When the dark-purple crystals of potassium permanganate or solutions made from them come in contact with substances which combine rapidly with oxygen, they may explode. If for any reason a solution of potassium permanganate is kept in the home, it should be stored in a glass-stoppered bottle to prevent pieces of cork falling in and causing an explosion.

First-Aid Applications for Burns

Tannic acid, which literally tans the tissues, has been for some time the classic standby among the remedies used for burns. Wet tea leaves had been used for centuries as an old wives' remedy for burns before it was discovered that their efficacy was due to the tannic acid in tea. Tannic acid acts as an astringent. An astringent achieves its effect on

tissue by coagulating the proteins in the cells with which it comes in contact, just as the albumin of egg white, which is practically pure protein, is coagulated by heat. Astringent action causes tissues to contract and become hard. Commercially tannins, which are vegetable astringents, are used to coagulate the protein in hides to make leather.

The tannic acid used in treating burns is obtained chiefly from the nutgalls of oak trees. It is a light-grayish-brown fluffy powder very soluble in water. When applied to a burn, it coagulates the dead tissue so that a thick, hard crust forms over it. This relieves pain by protecting the exposed nerve ends, checks the escape of body fluids, and acts as a covering under which new skin may grow.

Tannic acid should not be used by a layman for the first-aid care of deep or extensive burns, as the tanning process may interfere with subsequent medical treatment. Also dirt and germs may be sealed under the crust which forms over the burned surface. A 5% solution of tannic acid in a water-soluble base, known as tannic-acid jelly, is now available and may be kept on hand for the care of minor burns.

Picric acid is a phenol compound frequently used in the first-aid care of burns. Sterile gauze is soaked in a saturated aqueous solution of the pale-yellow crystals of picric acid and is then dried and sealed in packages. Before using it to cover a burn, the gauze is moistened with clean, preferably warm, water and applied several layers thick. Picric acid has an anesthetic as well as an antiseptic action. Thus it helps to relieve the pain of a burn and tends to prevent the development of infection. It leaves a yellow stain on the skin and fabrics which may be removed by applying potassium sulphate and then washing with soap and water.

Sodium bicarbonate from the drugstore, or its less expensive but just as effective counterpart, ordinary baking soda from the grocery, is a very useful adjunct of the first-aid cabinet because it may be combined with water to make a

very good moist dressing for burns, insect stings, ivy poisoning, and other skin irritations.

Emollients

An emollient is any substance which has a soothing effect on the skin. Usually emollients are of a fatty or oily nature and serve to soften, soothe, and protect the skin. They may be used for chapped skin, burns in which the skin is merely reddened, and abrasions. Examples are boric-acid ointment, zinc ointment, vaseline (petrolatum), lard, cocoa butter, and olive oil.

Sterile castor oil or sterile mineral oil is recommended as an emollient for the eye after giving first-aid care for an eye injury. A one-ounce bottle of oil may be sterilized by setting it in a pan of boiling water for fifteen minutes. If the bottle is kept tightly corked, the oil will remain sterile for a long time. Sterile oil also may be purchased in small tubes for first-aid kits.

An eyedropper used for putting drops in the eyes should be cleansed thoroughly after use and rinsed first with alcohol and then with water. Since the rubber tops of eyedroppers and medicine droppers are likely to become weak, they should be inspected once a month.

THE MEDICINE CABINET

The family medicine cabinet, which has become almost as important a household fixture as the radio, is usually the repository for a strange conglomeration of headache remedies, cathartics, half-empty bottles of cough medicine, and medicines left over from previous illnesses. One of the dangers of the family medicine cabinet lies in the possibility it affords of turning people into medicine "topers." The medicine cabinet of a hospital does not contain so formidable or so long a list of common remedies as does the cabinet in the bathroom of the average home.

The well-run medicine cabinet contains only medicines

prescribed by a physician in a current illness and a few first-aid supplies required for handling emergencies or temporary minor ailments. Half-used prescriptions should be thrown away after their immediate usefulness is over, and medicine prescribed for one person should not be given to another. Grandma's cough medicine, for example, should not be used for the baby. Medicines containing poisonous drugs, such as strychnine and opium, should be kept on a separate shelf and carefully labeled. When taking or giving medicine, it is important to look twice at the label, as nurses are taught to do. At night the light should always be turned on before taking or giving medicine.

FIRST-AID SUPPLIES FOR THE MEDICINE CABINET

Two fluid ounces of aromatic spirits of ammonia
A mild laxative like milk of magnesia or mineral oil
Epsom salts
Aspirin in five-grain tablets
Bicarbonate of soda
A small bottle of sirup of ipecac
Oil of cloves, for the temporary relief of toothache
A small can of dry mustard, if this is not kept on hand in the kitchen
A graduated medicine glass
A medicine dropper with a curved tip
A clinical thermometer in its case
Paper cups

Emetics, Antidotes, and Demulcents

Emetics are substances which induce vomiting. They act by irritating the lining of the stomach. Ipecac and squill are two common emetics. A teaspoonful of sirup of ipecac followed by a drink of warm water is frequently used to make a child with spasmodic croup vomit the mucous secretion which causes choking.

In poisoning cases, however, when the object of vomiting

is to wash out the stomach, a very large quantity of luke-warm water "seasoned" with mustard, salt, or soapsuds makes the best emetic. The use of emetics in cases of poisoning is discussed in Part II under Chemical Poisoning (pages 87-88).

An antidote is a substance which prevents the absorption of, combines chemically with, or counteracts the effects of a poison. Antidote means, literally, "against the given." As might be expected, an antidote, generally speaking, is the opposite of the substance against which it works. Thus, the antidote for an acid would be an alkali and the antidote for a sedative would be a stimulant.

If the antidotes of any poisonous substances kept in the home (cleaning materials and rat and insect poisons, for example) are not common substances like soapsuds, vinegar, olive oil, lemon juice, baking soda, mustard, salt water, and so on, a supply of the antidote recommended on the container should be kept on hand.

A demulcent is a substance which has a soothing effect on inflamed mucous membrane. After everything possible has been done to remove or counteract the effects of a poison, a demulcent is generally administered. Common demulcents which are usually available in every household are raw eggs, milk, and a thin paste of starch or flour in water.

Stimulants

Stimulants are drugs that increase the activity of the nervous system or improve the action of the heart. In first-aid work a stimulant is usually given to ward off or to treat shock if the injured person is conscious. However, *a stimulant must not be given in cases of head injury, severe bleeding, or suspected internal injury*. The reason for this is that a stimulant speeds up body activities, including the action of the heart. The faster and stronger the heart beats, the more blood will be pumped out through an external or internal

wound. Quickened circulation through blood vessels damaged or bruised as the result of a head injury may result in a fatal brain hemorrhage.

The most common stimulants are aromatic spirits of ammonia (from one half to one teaspoonful in half a glass of water) and hot, strong coffee or tea, well sweetened. Coffee and tea owe their stimulating action to the drug caffeine. If a stimulant is not available, a drink of hot water or hot milk will be helpful. If a person is not conscious, an inhalant stimulant is often useful. Smelling salts or a few drops of diluted household ammonia or aromatic spirits of ammonia on a handkerchief are good inhalant stimulants.

Many people are under the impression that alcoholic beverages, such as whisky and brandy, are stimulants. As a matter of fact, the stimulant action of alcohol is followed by a depressant action. If given to an injured person to ward off or counteract the effects of shock, for example, it is likely to increase rather than to decrease the danger. An alcoholic drink may be useful in some cases to allay pain and fear, but *under no circumstances should it be given when a stimulant is indicated.*

Sedatives and Analgesics

There are many drug preparations on the market which have a soothing effect on the nervous system and thus induce sleep, relieve pain, or stop coughing. Since many of these preparations contain habit-forming drugs, or drugs to which some people may be especially sensitive, patent cough mixtures, sleep inducers, and pain relievers should not be given "parking space" in the household medicine cabinet. Medicine of this kind should be taken only when prescribed by a physician.

The only exception is aspirin in five-grain tablets or some other preparation of acetylsalicylic acid recommended by your doctor. Acetylsalicylic acid is classed as an analgesic—that is, a drug which relieves pain by acting upon the sen-

sory nerve areas of the brain. When taken with lots of fluid, aspirin may be helpful in relieving headaches due to fatigue or excitement and the discomfort which accompanies a cold. It is sometimes used as a gargle during a cold to relieve sore throat.

Persistent or recurrent headaches and a cold with fever demand medical assistance. Taking headache pills (including aspirin) routinely for chronic headache and letting it go at that is a bad habit to form and is likely to be harmful, principally because it delays getting at the root of the trouble.

Cathartics

Cathartics are drugs that induce defecation (evacuation of the bowels). They act by speeding up the movements of the intestinal walls by which undigested food residues are pushed along and finally eliminated from the body.

Laxatives are mild cathartics. Among them are mineral oil, milk of magnesia, and agar-agar. Purgatives—for example, castor oil and calomel—produce more active intestinal movement. Saline purgatives, which prevent the absorption of water from the intestine, produce frequent watery stools, or bowel movements. Familiar examples are magnesium sulfate (Epsom salts), magnesium citrate (purgative lemonade), and Seidlitz powders. Epsom salts and milk of magnesia are useful in certain forms of poisoning.

A mild laxative, such as milk of magnesia or mineral oil, may be kept in the household medicine cabinet to be used as needed, but never routinely. Constipation usually can be prevented or remedied by eating bulky foods, such as fruits, vegetables, and whole-grain cereals, and by drinking plenty of water and other fluids. If it persists, a physician should be consulted.

Purgatives "to give the system a good cleaning out" are not as a rule recommended nowadays, very likely because physicians and surgeons have seen too many ruptured appendixes resulting from these remedies. *Under no circum-*

stances should a cathartic, mild or otherwise, be used in cases of severe or persistent abdominal pain. If the pain is caused by an attack of appendicitis, the use of a laxative or purgative is highly dangerous.

Antacids

Antacids are mild alkaline drugs used to reduce the acid concentration of the contents of the stomach. Excess acidity of the stomach is one of the chief causes of so-called indigestion. The most familiar antacids are sodium bicarbonate and magnesium oxide. Milk of magnesia in small doses also acts as an antacid.

Taking Body Temperature

A clinical thermometer is used to take body temperature. It has an arrow pointing to the average normal temperature, which is 98.6° by mouth and 99.6° by rectum. A rectal thermometer should be used to take the temperature of babies and small children. The tip is greased with a little vaseline and inserted carefully into the rectum for about two inches. It should be held in place in most instances to insure accuracy of recording and to prevent breakage. If a rectal thermometer is not available, the temperature of an infant or small child may be taken by holding the bulb of an ordinary clinical thermometer in the armpit while keeping the arm closely pressed against the side. Average normal armpit, or axillary, temperature is about the same as mouth temperature.

Before taking the temperature by mouth or rectum, first shake the thermometer until the top of the column of mercury is two or three degrees below the normal mark. Grasp the thermometer at the top to avoid contaminating the bulb. Let the thermometer remain in the mouth (under the tongue with lips closed) or rectum for at least three minutes. Wipe it downward with a dry piece of cotton before reading it. It is a good idea to learn how to "read" a

clinical thermometer by practicing on yourself if you do not know how to do so already. A mouth temperature of more than 99° F. or a rectal temperature of more than 100° F. is an indication of fever. Fever is a universal objective sign of trouble and should be reported to a physician.

A clinical thermometer should be cleansed thoroughly after use with two or three cotton pledgets moistened with soap. Starting at the top, rub downward with a spiral rotary motion. Rubbing the thermometer with a pledget of cotton moistened with alcohol may obliterate the markings and is not considered necessary. Soap plus friction is adequate for ordinary cleansing. The thermometer should then be rinsed well with clear water and wiped with a dry cotton pledget before returning it to its case. If some time goes by before the thermometer is used again, it should be cleansed with soap and rinsed well immediately before use. Confinement in a dark case favors the multiplication of any germs which may have escaped destruction after the last cleansing.

During an illness when the thermometer must be used several times a day, it should be kept in a small glass filled with alcohol or mouth wash, with absorbent cotton at the bottom to prevent breakage. It should be rinsed with water and wiped dry with a pledget of cotton before taking the temperature.

Miscellaneous Supplies

A hot-water bottle with cover

An ice bag

Enema and douche bag (to be used as indicated by the physician)

A flashlight

A hot-water bottle or some other device for applying external heat is used in certain cases to ward off shock as a result of injury (see page 96). Either a hot-water bottle or an ice bag may be used for the local relief of pain. Neither should be applied, however, in cases of severe or persistent

abdominal pain which may possibly be appendicitis. It is important to test the heat of a hot-water bottle against the back of the hand or the cheek and to put its cover on before applying it. Rubber hot-water bottles and rubber ice bags should be allowed to dry out after use and should be dusted with talcum powder before they are put away.

First-Aid Kits for Travelers

Naturally a first-aid kit for use on expeditions away from home cannot be so elaborately stocked as the household first-aid kit and medicine cabinet. Unit-type kits for hikers, campers, and motorists may be purchased in an assortment of sizes in any drugstore. Unit-type kits contain a complete stock of first-aid materials put up in standard packages of unit size. The unit packages fit like blocks in the case and cannot shift out of place if they are put back properly after use. Unit refills are readily obtainable.

For those who wish to assemble their own kits, a metal safe-deposit box or a metal tackle box made for the use of fishermen makes a strong convenient container. Such a box may be bought at a hardware store or a sporting-goods store for fifty cents "and up."

A kit for hikers and campers should contain at least the following supplies. The quantities to purchase depend upon the number of persons in the party.

Sterile one-inch gauze compresses on adhesive tape in sealed envelopes
Sealed packages of one-inch and two-inch gauze roller bandage
Triangular bandages
Folded pieces of sterile gauze in sealed packages
A roll of adhesive tape
Aromatic spirits of ammonia in ampoules
Mild tincture of iodine in ampoules
A tube of tannic-acid jelly

in one spot the contents of the body. Besides keeping the body intact as a self-contained living organism, the skin protects the body from things in the outer world which might harm it. The unbroken skin is a tight screen against most bacteria. It is only when there is a gap in the continuity of the skin that bacteria can get in, just as mosquitoes can get through a fine-meshed screen only when there is a gap in the screen. Bacteria are present in practically all accidental wounds. That is why covering a wound with a sterile dressing to prevent further infection is essential in the first-aid care of breaks in the skin.

A third duty of the skin is that of helping to control body temperature. The heat of the body is generated by the burning of fuel foods (chiefly fats, sugars, and starches) by working muscle cells. The circulating blood maintains a more or less even temperature throughout the body by distributing heat from these innumerable tiny furnaces. The harder the muscles work, the more heat is produced—much more during vigorous exercise than is needed to warm up colder regions of the body. If there were no way of getting rid of this excess heat, we should be in a continual state of fever varying with the amount of physical activity engaged in. This would never do because the body cells are used to a uniform temperature, and extreme variations in either direction are dangerous. An extreme subnormal temperature produces unconsciousness and may lead to death, as in general freezing. A high fever, on the other hand, as in sunstroke, will, if continued for some hours, produce profound disturbances in the cells of the brain.

The body temperature of human beings normally stays at about 98.6° F. because there is a nice balance between heat-generating and heat-dispelling processes. The mechanism for regulating body temperature is controlled by a "thermostat" located in the central nervous system. To increase heat loss when conditions favor a rise in body temperature above normal, the miles of tiny blood vessels near

the surface of the skin are dilated so that they can hold an extra amount of blood, and the skin becomes red, as in vigorous exercise or fever. If the temperature of the surrounding air is colder than the blood, the extra heat radiates from the skin, just as heat radiates from the steam or hot-water pipes of a radiator, and is carried away by means of currents of air.

If the surrounding air is too warm to permit heat to escape by radiation, conduction, and convection, nerve impulses stimulate the millions of sweat glands in the skin to pour out perspiration. The evaporation of the sweat eliminates heat from the body. Sponging the skin with cool water, as in the first-aid care of a victim of sunstroke, helps to reduce fever by adding to the amount of moisture to be evaporated.

To conserve heat when conditions favor a lowering of body temperature, the blood vessels in the skin are tightened up so that very little blood can flow through them, and the sweat glands are inhibited to prevent the flow of perspiration to the surface of the skin. In shock the amount of blood circulating in the blood vessels near the surface of the body is greatly reduced with the result that the victim feels cold. For that reason measures are taken to assist the body in its efforts to conserve heat.

THE FRAMEWORK

Bones joined together to form the skeleton give the human body its distinctive shape. The skeleton provides the necessary support and protection for the soft parts of the body and gives points of attachment for the muscles which make possible all voluntary movements such as walking, chewing, and writing.

The first thing to know about the skeleton is that it is the part of the body which is formed last. A newborn baby has very little stiffening in its bones. As the child grows, stiffening is added, as it is needed, to the tough flexible

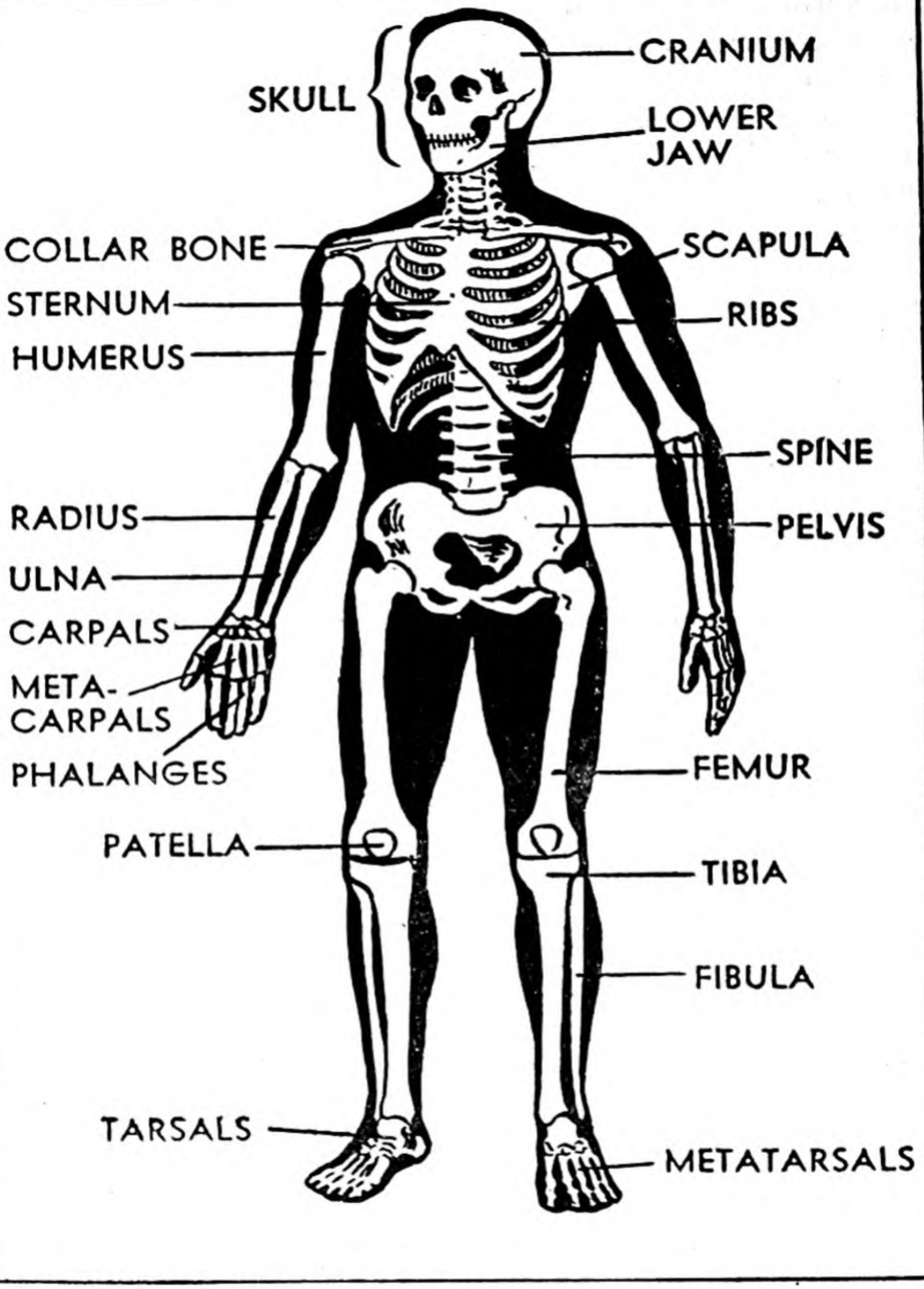


Figure 4. The skeleton

material called cartilage from which the skeleton develops.

The stiffening of the skeleton is composed of nonliving material laid down by living bone cells. The bone cells surround tiny canals in the bone through which blood vessels and nerves run. The calcium and phosphorus from which the stiff part of bone is made come from food and are brought to the cells by the blood.

The bones of children contain more living material in proportion to stiffening than do the bones of adults. This means that children's bones do not break so easily, just as a green branch breaks less easily than does a comparatively dry one. When a child's bone does break, it usually heals readily because there are plenty of active bone cells present to take care of the necessary repairs. On the other hand, the bones of old people contain relatively few living cells and are thus drier and more brittle than are the bones of young people. Sometimes the broken bone of an old person does not heal at all.

The Skull

There are two kinds of skeletons in the animal kingdom —one kind is attached on the outside, as in lobsters, turtles, clams, and snails, and the other kind is fixed on the inside with soft tissues molded over it. Human beings have both kinds. The skull is really an outside skeleton admirably fitted to protect the brain—an exceedingly delicate organ of the body which has no occasion to move.

The brain is housed in the cranium, or upper part of the skull. The cranium is composed of eight immovable interlocking bones. The lower part of the skull is made up of the fourteen bones of the face. These also are immovable, except for the lower jaw, which has hinged joints allowing it to move up and down.

Blood vessels and nerve trunks pass in and out of the brain through openings in the floor of the cranium. The largest opening is an outlet for the constricted part of the

brain where it narrows down to join the spinal cord. Three layers of delicate membrane moistened with fluid between are all that separate the cranium from the brain.

The close fit of the brain in the cranium, or brain case, largely accounts for the concussion which may follow a head injury. Although the cranium is very tough, a blow may crack it, causing "skull fracture." Even if there is no fracture, the sudden violent jar of a blow on the head may lacerate or bruise the brain. Injury to the brain may cause it to swell and press against the walls of the cranium, which cannot "give" to make extra room. Unconsciousness and sometimes death may result from increased pressure on or in the brain.

The Skeleton of the Trunk

The bony framework of the trunk is made up of the backbone at the rear, the ribs at the sides, the breastbone in front, and the pelvis below. The cavity of the trunk is divided by a thin, dome-shaped partition of muscle called the diaphragm. Above the diaphragm is the chest cavity occupied by the heart and lungs. Below it is the abdominal cavity containing the stomach, liver, spleen, pancreas, intestines, kidneys, and the pelvic organs.

The Spinal Column

The backbone or spinal column is made up of a number of pieces of irregularly shaped bone called vertebrae. They are piled on top of one another to form a strong flexible column with cartilage and ligaments binding each to each. In the adult, the upper twenty-four vertebrae are separate and movable throughout the whole of life. The nine vertebrae found in the pelvic or lower region of the trunk are firmly united in the adult so that they form two bones, five making the upper bone or sacrum, and four the "tail" bone or coccyx.

The whole spinal column is hollow, and through the center of it, like a cord running through a string of spools,

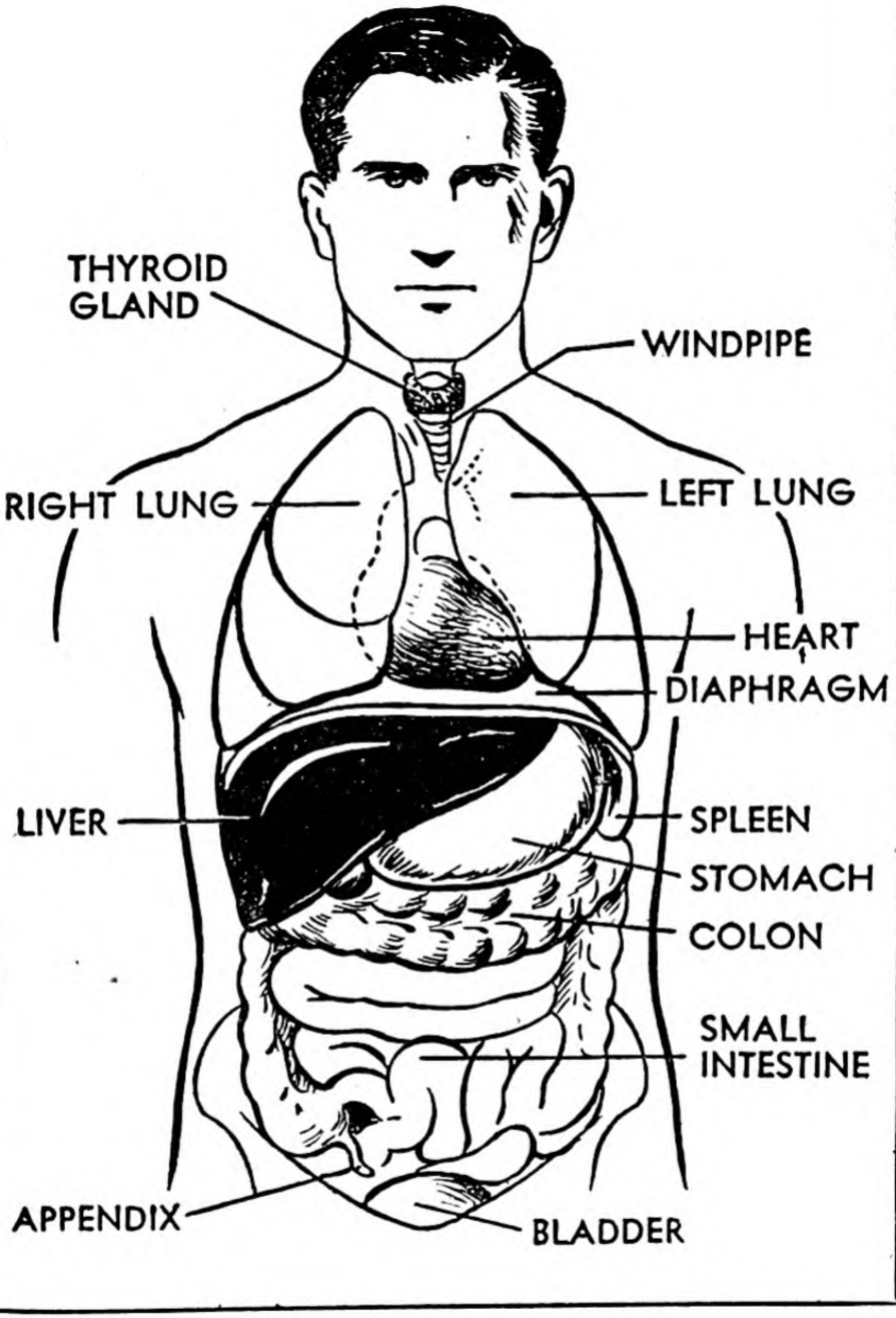


Figure 5. Organs of the chest cavity and the abdominal cavity

goes the rope of nerve fibers and nerve centers called the spinal cord. The spinal cord is a prolongation of the brain and as such plays a vital part in body government. It is easy to see that any break in the spinal column would threaten the safety of the precious spinal cord which it protects. That is why it is necessary to use extreme care in moving a person whose back has been injured.

The Breastbone and Ribs

The breastbone, or sternum, is a flat, narrow bone about six inches long situated in the middle of the front wall of the chest. The two collarbones are fastened in front to the top of the breastbone, and the seven upper pairs of ribs fit into notches down each side. Each of the next three ribs in each pair is fastened to the rib just above it, and the two lowest are unattached in front and are called floating ribs. In back the ribs are hitched to the spinal column in such a way that they can be lifted and lowered by the chest muscles in breathing.

The cagelike arrangement of the chest is an admirable compromise between stability and mobility. The heart and lungs are indispensable organs which must be protected as much as possible and yet they cannot be enclosed tightly in a rigid box, as the brain is, because the lungs must expand in breathing and the heart must beat.

The Pelvis

The ceiling of the abdominal cavity in the lower part of the trunk is the dome-shaped diaphragm; its floor, the basin-shaped ring of thick heavy bones called the pelvis; and the "beam" in its back wall, the lower part of the spinal column. The pelvis is composed of four bones—the two hipbones at the sides and front and the sacrum and coccyx completing it behind.

The hipbones are irregularly shaped bones resembling

nothing which might have suggested a name to the ancients and hence came to be called *innominata,* or nameless. The upper portions of the hipbones, sometimes called the greater or false pelvis, flare up and back from the brim of the lesser or true pelvis. The lower narrowed portions curve around to the front and meet to form the pubic arch. The urinary bladder is just behind this narrow bridge of bone. Fracture of the pelvis is a serious injury, principally because of the danger of puncturing the bladder.

Arms and Legs

The arms and legs are called the extremities of the body. Arms and legs are essentially very much alike—one long strong bone nearest the body, then two bones, then a lot of little bones forming, in the arm, the wrist and hands, in the leg, the ankle and foot. The head of the armbone nearest the body (the humerus) fits into a shallow cup in the shoulder blade or scapula. The scapula itself is attached by muscles to the collarbone and chest. The whole arrangement is loose and free. The head of the humerus is quite easily dislocated, that is, pulled out of the cup in the shoulder blade into which it fits.

The leg is not nearly so mobile as the arm. Sturdy support for the body's weight with a reasonable degree of movability is all that is required of legs. The rounded head of the thighbone (the femur) fits firmly into a socket in the hipbone. Its lower end broadens out and helps to form the hinged knee joint. The knee joint is protected by a triangular cap of bone, the patella.

Joints and Ligaments

A joint is the meeting place of two or more bones. Some bones that are needed only for protection, like the bones of the cranium, are immovable at the joint. In the movable joints, strong white bands, or fibers, called ligaments extend

over the joint or completely surround it. The articulating, or joining, surfaces of the bones are clothed with smooth, tough cartilage. The cartilage in turn is lined with a thin membrane which secretes a thick fluid like the white of egg. This fluid oils the joint so that in moving the bones rub against each other without friction or creaking. When a joint is wrenched or twisted so that the ligaments are stretched or torn, a sprain is the result. If in addition to a sprain the bone is pulled out of place, the injury is called a dislocation.

Muscles and Tendons

The movable bones of the body are operated by the muscles attached to them. Most muscles are attached to the bones they move by strong white cords called tendons. All muscles attached to bones (skeletal muscles) are voluntary —that is, they obey commands dictated by the will of the individual. A voluntary muscle works by becoming shorter and thicker so that its two ends are brought nearer together. This work is called contraction.

A muscle produces motion because at one end it is attached to one of the two bones which meet at a joint and at the opposite end to the other bone. As the muscle contracts, or shortens, it draws the two bones nearer together with the joint as a pivot. Almost all skeletal muscles are arranged in antagonistic pairs, one of which opposes the other. One set, called flexors, bends up a part (the arm, for example), and the opposing set, called extensors, straightens it out. When either the flexors or the extensors contract, the opposing group relaxes.

There is another group of muscles not subject to the will which contract without conscious control or intention. These muscles are called involuntary. They cause motion in the walls of the blood vessels and in the viscera—that is, the heart, stomach, intestines, and other organs within the body cavities.

HOW MATERIALS ARE TRANSPORTED IN THE BODY

The cells which compose the more or less solid parts of the body are anchored in place and cannot forage for supplies. Thus, everything they need—oxygen, water, and food—must be delivered to them, and all their waste materials must be carried away. The "common carrier" of the body is the blood stream.

The Blood

Blood, which makes up about 6 to 8% of the body's weight, is partly solid and partly liquid. The solid part is made up of trillions of extremely small red disks (the red corpuscles), millions of minute white cells (the white corpuscles), and an immense army of infinitely small bodies called blood platelets. The liquid part is the plasma—a thickish, straw-colored fluid containing salts, sugar, and gluey albuminous material.

Red corpuscles are red because they contain hemoglobin, an iron compound, which gives them the power to take up and release oxygen. The red corpuscles take up practically a full load of oxygen as the blood passes through the lungs and then unload it in other parts of the body where the cells need it. On the way back to the lungs from the tissues, the red corpuscles help to carry carbon dioxide, one of the waste products of cell activity. Carbon dioxide diffuses from the blood into the air sacs of the lungs, from which it is discharged on each outbreath or expiration.

Unfortunately, the red corpuscles can combine far more readily with the poisonous gas carbon monoxide than with oxygen. Carbon monoxide is present in all unburned artificial gas and is produced in the burning of all fuels. When a person inhales carbon monoxide, this gas monopolizes all the available space in the red corpuscles, so that there is no room left for oxygen. As a result, his body suffers from oxygen starvation which will inevitably result in death unless he is rescued in time and given artificial

respiration if normal breathing is weak or has stopped.

The white corpuscles of the blood belong to the class of wandering body cells called phagocytes or cell eaters. They have the power of independent motion and can go anywhere they are needed. The function of white corpuscles is the removal of a variety of substances which are useless or actually harmful to the body. All bacteria are their legitimate prey. The pus which is a sign of wound infection gets its yellowish-white color from the hosts of white corpuscles that have died in the battle with invading bacteria.

The plasma amounts to more than half the total mass of the blood. It carries to every cell in the body the digested food materials which enter the blood stream as it passes through the walls of the small intestine. The plasma also carries waste substances produced by the working cells and delivers these wastes dissolved in water to the kidneys for removal from the body in the urine.

The plasma also has the power to change from a liquid to a jelly at the site of a wound. If it were not for the ability of the plasma to clot or coagulate and plug a break in the skin, we should bleed to death from the slightest injury. Proof of this is found in the serious hemorrhage which occurs in "bleeders" (persons whose plasma does not clot or clots too slowly) after minor injuries or operations. The blood platelets play an important role in starting the complicated process of clot formation.

When a person has lost a great deal of blood or is suffering from shock as a result of serious injury, a blood transfusion may be necessary to save life. Restoring the normal volume of the circulating blood is the objective of blood transfusion in shock. For that purpose plasma is as effective as whole blood. A method has now been worked out by which the corpuscles are removed from the blood taken from blood donors, leaving only the plasma. This plasma can be dried and kept indefinitely. Dried plasma shipped to the battle fronts is used to save the lives of seriously in-

jured soldiers and sailors. By adding distilled water the plasma can be administered immediately. The Blood Donor Service of the American Red Cross has established blood-donation centers in the larger Red Cross chapters, where volunteer blood donors can give the blood so urgently needed for emergency transfusions. Any healthy man or woman between the ages of twenty-one and sixty years can be a voluntary blood donor.

How Blood Is Kept on the Move

Blood circulates through the body in a vast system of enclosed tubes—the blood vessels. The pump which keeps the blood in motion is the heart. This pump is divided down the middle into two compartments, a right and a left. Each of these compartments is in turn divided into two chambers, with a trap door or valve between. The upper chambers are called auricles; the lower ones, ventricles. At each beat or contraction of the heart, blood is pumped from the right ventricle to the lungs and from the left ventricle to all the rest of the body. At each relaxation of the heart, blood flows into the right auricle from all the rest of the body and into the left auricle from the lungs. The reason for this arrangement is that blood after its journey through the body is rich in carbon dioxide and poor in oxygen. Thus it must be sent to the lungs to unload carbon dioxide and take on oxygen before starting on another round trip.

The vessels which carry blood *away* from the heart are the arteries. The big trunk artery of the general circulation, the aorta, springs directly from the left ventricle and then subdivides into innumerable branches leading to all parts of the body except the lungs. The arteries end in networks of exceedingly small tubes, finer than any hair, the capillaries.

The blood vessels which carry blood back to the heart are the veins. Beginning as tiny tubes leading out of the capillary networks in the tissues, the veins of the general circula-

tion merge to form increasingly larger vessels until finally they end in the two large veins through which blood flows into the right auricle of the heart.

Each time the heart beats, the load of blood pumped into the stream of blood already in the arteries starts a distending wave which may be felt in the wrist at the base of the thumb as a "pulse." The pulse rate for the normal adult is about seventy-two beats per minute. The fact that the blood moves through the arteries in waves accounts for the spurting of blood from a cut artery. By the time the blood reaches the veins, its pulsating rush has been spent. Thus the blood from a cut vein flows out in a steady stream.

The blood-vessel system must always be overfilled with blood in order to maintain normal blood pressure. If too much blood escapes from a wound, the blood pressure falls, and, as a result, the blood does not flow fast enough to deliver the oxygen which of all the supplies obtained from the outer world the cells need most urgently and continuously. This is the principal reason why severe bleeding is one of the big three emergencies which the first-aid worker must know how to handle.

The Capillaries

The networks of extremely fine tubules in which the arteries end and from which the veins begin are intimately insinuated between the cells everywhere in the body. It is impossible to prick through the skin anywhere without puncturing capillaries. Since blood merely oozes from punctured capillaries, it usually clots of its own accord to plug the leak.

Gases such as oxygen and carbon dioxide and food materials and wastes in watery solution readily pass through the tenuous walls of the capillaries. The walls of the arteries and veins are too thick to permit the passage of material to and fro. Thus we may say that all the rest of the circulatory system exists only to get blood into the capillaries

through which the process of exchange between the blood and the cells takes place.

The Tissue Fluid

The lymph or tissue fluid which bathes all the living cells in the body is produced by the filtering of part of the plasma through the capillary walls. Since lymph lies between the blood vessels and the cells, all the substances exchanged between the cells and the blood must pass through it. Lymph moves sluggishly from the blood stream to the tissues and back to the blood stream. Thus, the fluid bathing the tissues is always kept fresh. Some lymph passes back into the blood through the capillary walls. The rest enters a definite system of thin-walled tubes—the lymphatics—and flows through them to two large veins near the heart, where it is emptied into the blood stream. Along the course of the lymphatics are nodes or "glands" which act as sieves to hold back small particles, including bacteria, which may have found their way into the tissues. In protecting the body in this way, the lymph glands may become enlarged. They can then be felt as swollen, tender lumps.

HOW THE CELLS ARE SUPPLIED WITH OXYGEN

The most pressing need of the body cells is oxygen. They cannot live for more than seven or eight minutes without it. The arrangement by which oxygen from the air is brought to the place where it can enter the blood stream for transportation throughout the body is called the respiratory system.

The Respiratory System

Air enters the body through the nose (or mouth), where it is warmed, moistened, and filtered, passes into the back of the throat, or pharynx, and thence into the trachea, or windpipe. At the top of the windpipe there is a small, hinged trap door, the epiglottis, which shuts when food is

swallowed to keep the food from going down the wrong way—that is, into the windpipe instead of into the food tube (the esophagus). When a person is unconscious, the epiglottis may fail to close. That is why liquids poured into the mouth of an unconscious person may get into his windpipe and cut off the passage of air to the lungs, thus causing suffocation. Foreign objects lodged in the throat or windpipe also may cause suffocation by blocking the passage of air.

The windpipe branches just before it enters the lungs into two tubes, the bronchial tubes. One branch goes to each lung. After entering the lungs, the bronchial tubes divide and subdivide until finally they end in tiny blind pouches called air sacs, or alveoli. Upon reaching these millions of tiny terminal stations in the lungs, the air exchanges part of its freight of oxygen for a cargo of carbon dioxide delivered at the same terminals by the blood.

The blood in the lungs is spread out in very close networks of capillaries lodged in the walls of the alveoli. Oxygen diffuses from the air sacs into the blood stream through the extremely thin films which make up the alveolar and capillary walls and is carried thence to all parts of the body. Carbon dioxide diffuses from the blood stream into the air sacs and is carried out of the body at each exhalation.

The Mechanics of Breathing

Through the motions of breathing, the air in the air sacs of the lungs is constantly being changed, just as a room is ventilated when arrangements are made for the movement of air in and out. The lungs are soft, elastic bags which have no power of independent motion. They are suspended from the top of the chest cavity which they fill except for the space taken up by the heart, the windpipe, the esophagus, and various "small parts." The passage of air into and out of the lungs is purely a mechanical process brought about by changes in the size of the chest cavity.

When we breathe in or inhale, the diameter of the chest from front to back and from side to side is increased by muscles which tighten and lift the ribs and breastbone up and outward. At the same time, the vertical diameter is increased by the contraction of the diaphragm. When the diaphragm contracts, its two ends are drawn closer together and its center goes down, thus making the chest cavity longer from top to bottom. The lungs stretch to fill the enlarged chest cavity as air, which has a pressure of nearly fifteen pounds to the square inch, rushes into them. Air is expelled from the lungs on the outbreath by pressure from the walls and floor of the chest cavity as the relaxation of the breathing muscles allows them to return to their normal positions.

Artificial respiration, by which pressure on the chest is alternately applied and released *from the outside,* duplicates the changes in size of the chest cavity which make possible the entry and exit of air during natural breathing. This method of keeping up respiration until the body itself can take over has saved thousands of lives (see pages 67-70).

The Control of Breathing

The average rate of breathing for an adult is from about sixteen to eighteen complete respirations (breathing in and out) per minute. Breathing is controlled by a nerve center in the lower part of the brain called the "respiratory center." This center is extremely sensitive to any increase in the amount of carbon dioxide in the blood passing through it. When the muscles are working extra hard, as in vigorous exercise, much more carbon dioxide than usual is produced, with the result that the lungs cannot get rid of it fast enough at the normal rate of breathing. With the piling up of carbon dioxide in the blood, impulses are rushed to the breathing muscles from the respiratory center and breathing becomes much faster and deeper than usual.

Any injury that paralyzes the respiratory center—for ex-

ample, electric shock—or any condition that cuts off the supply of air to the lungs—such as drowning, hanging, choking, or smothering—will cause asphyxia or suffocation. Unless the person is rescued quickly and artificial respiration started if breathing has stopped, death will result.

WHERE FOOD IS PREPARED FOR THE CELLS

Food is prepared for the use of the body cells in that part of the alimentary canal which extends from the mouth to the small intestine. The alimentary canal leads continuously through the body without a break from the upper opening, the mouth, to the lower opening, the anus.

The Alimentary Canal

Beginning as a fairly straight, narrow tube (the esophagus), the alimentary canal pierces the diaphragm at the back, widens into the stomach just below the diaphragm, then narrows into the twenty-two feet of coiled tubing forming the small intestine, widens again into the large intestine, and finally terminates with the rectum or lower part of the large intestine. The outlet at the far end of the rectum is the anus. At strategic places along its course, the alimentary canal is equipped with sphincters (circular muscles) to hold the food back or to let it through as occasion requires. After the momentum of swallowing has given the food a good push down the esophagus, the food from then on is forced along in waves called peristaltic waves produced by the movement of the muscular walls of the alimentary canal.

In the mouth, stomach, and small intestine the food is broken down chemically by the action of the digestive juices and dissolved in water so that it can pass from the small intestine into the blood stream through the thin lining of the intestinal wall and the walls of the capillary networks lying within it. Undigested food is eliminated in

the form of a "movement of the bowels" by way of the large intestine, rectum, and anus.

The important thing about the alimentary canal, so far as first-aid measures are concerned, is that substances may go into it through the mouth and pass through it without being *in* the body in any other sense. Thus poisonous substances swallowed may be kept out of the body if drastic measures are taken to eliminate them from the stomach by vomiting or the use of a stomach tube. Also, many varieties of bacteria, which if introduced into the blood stream might cause serious trouble, are overcome by acids and other hostile substances in the stomach and other parts of the digestive tract.

The digestive tract is subject to many disturbances but usually these do not call for first aid before a doctor is consulted. The chief exception is appendicitis, which may be sudden in its onset and require prompt action. The appendix is a small pouch normally about the size of the little finger of a glove, which opens out of the large intestine near its beginning low down on the right side of the abdomen. The appendix has been called "one of the disastrous mistakes in human anatomy," since it appears to serve no useful purpose and is peculiarly prone to infection. The blood supply of the appendix is meager, and it has no opening except into the large intestine. Thus it forms a sort of blind alley which is easily clogged with debris. If it becomes inflamed and ruptures into the abdomen, a dangerous condition called peritonitis is apt to set in. The symptoms of appendicitis and what to do for the sick person before the doctor arrives are given on pages 102-103 in Part III.

The sensitiveness of the digestive tract to disturbances elsewhere in the body sometimes results in misleading symptoms. Thus nausea, diarrhea, or a stomach-ache may lead to the diagnosis of a digestive upset of some kind, whereas

the real trouble is not in the digestive tract at all. This is another instance of the mistakes which often lead to disaster when a layman tries his hand at diagnosis.

HOW THE ACTIVITIES OF THE BODY ARE CO-ORDINATED

The function of the nervous system is to keep the individual in touch with the outside world and to co-ordinate the work of the different parts of his body. Hence this system is divided into two great divisions—one acting outwardly and one acting inwardly. Through the outward-acting, or voluntary, nervous system the individual governs his relations with the outside world. Through the inward-acting, or involuntary, nervous system the internal affairs of the body are governed without direction from the individual. Both divisions have their headquarters in the brain and spinal cord.

The Outward-Acting Nervous System

Nerve fibers of the outward-acting nervous system connect centers in the brain and spinal cord with every point on the surface of the body and with every voluntary muscle. The nerve fibers ending on the surface of the body pick up and transmit to the brain information needed by the individual in his dealing with the things and people in the outside world. These nerve endings are called sense organs. They receive and send to the brain impulses which evoke the sensations of sight, sound, touch, taste, smell, heat, cold, and pain. When the brain is injured or its blood supply is interfered with, it cannot receive impulses from the sense organs. The individual is then unaware of his surroundings; he is unconscious.

Another set of nerve fibers, the motor nerves, lead out from the brain and spinal cord to the voluntary muscles. They carry the commands which make the muscles respond to the will of the individual. The motor nerves cannot operate the muscles if the motor centers in the brain are in-

capable of sending out the necessary commands or if the nerve connections between brain and muscle are interrupted somewhere along the line. When that happens, the muscles involved become paralyzed. For example, if the back is broken, pressure of the broken vertebrae on the spinal cord may cut or injure the cord so that neither sensory nor motor nerve impulses can reach their destinations. The result is loss of feeling and paralysis below the part of the cord injured.

The Inward-Acting Nervous System

The inward-acting, or involuntary, nervous system acts automatically without direction from the thinking part of the brain to adjust the work of the different parts of the body for the good of the whole. It supplies nerves to the glands, the involuntary muscles of the inner organs, the blood vessels, and the skin. It is this system which regulates the rate of the heartbeat, the movements of the intestinal walls, the secretions of the glands, and a host of other body functions. It makes us shiver, blush, turn pale, sweat, water at the mouth—in fact, respond *as we cannot help responding* to the emotions of love, fear, joy, anger, and shame and to the sensations of hunger, thirst, pain, and extremes of heat and cold. It produces many of its effects with the help of the adrenaline secreted by the adrenal glands. Shock is largely due to the effect of injury or profound emotion on the nerve centers of the inward-acting nervous system (see Shock, pages 92-98 in Part II).

PART II

ABC'S of First Aid

IN DEALING with any casualty, the first question to be asked is: *Is there any immediate danger to life?* The four chief dangers are:

A—Asphyxia
B—Bleeding
C—Chemical Poisoning
S—Shock

In the defense of life against death the measures taken to deal with these dangers are "priority" measures. To give competent first aid, you must be able to spot them at once and to attend to them first—before anything else is done. For that reason, the means of recognizing them and the ways of dealing with them are described first. The methods for giving artificial respiration, stopping severe bleeding, and treating shock should be practiced under expert supervision until you can do them automatically—almost without thinking.

ASPHYXIA

ACCIDENT	*CONDITION CAUSING ASPHYXIA*
Hanging Smothering Strangulation	The air passages are blocked from without so that air cannot reach the lungs
Choking Drowning (submersion) Falling back of the tongue in an unconscious person or one suffering from certain injuries of the lower jaw Swelling of the tissues lining the throat or larynx after swallowing corrosive poisons and during certain illnesses such as diphtheria	The air passages are blocked from within so that air cannot reach the lungs
Extreme and continued pressure on the chest walls in the crush of a crowd or as a result of burial under debris from a collapsed building, mine cave-in, fall of earth, stone, or sand, and so on	The chest cavity cannot expand to make room for the inflation of the lungs in breathing
Electric shock Breathing anesthetic gases Swallowing drugs which act as nerve poisons	The respiratory center in the brain is paralyzed and the breathing muscles cannot work
Breathing gases which act as chemical asphyxiants, the commonest and most important of which is carbon monoxide	The oxygen-carrying function of the red blood cells is interfered with so that the tissues are starved for oxygen
Breathing air deprived of oxygen through some process of oxidation, as in long-closed mine galleries, old wells, cisterns, silos, and the holds of ships Breathing air from which a simple asphyxiant gas, such as carbon dioxide or nitrous oxide, has excluded oxygen	The amount of oxygen in the air has been reduced below the minimum necessary to maintain life

ASPHYXIA is the condition brought about when the body cells are deprived of a continuous supply of oxygen. Since oxygen is not stored in the body in case of emergency as food and water are, survival becomes a matter of only moments when the body cells have used up what little oxygen is on hand in the red blood corpuscles and can get no more from the outside world. Certain cells in the brain are the first to be affected by a lack of oxygen.

Any body injury or condition which shuts air out of the lungs, as in drowning and smothering, or paralyzes the respiratory center in the brain, as in electric shock, or keeps the red blood corpuscles from taking up oxygen from the air breathed, as in carbon monoxide poisoning, causes asphyxia. The accidents most commonly responsible are listed on page 65.

In all cases of stoppage of breathing, artificial respiration by the prone-pressure method must be started immediately after rescue. However, it is well to be on guard against one common mistake made by the inexperienced first-aid worker. In his excitement he may give artificial respiration by the prone-pressure method to victims of apoplectic stroke, epilepsy, concussion of the brain, or internal injury, who are unconscious *but breathing*. Artificial respiration in such cases is definitely dangerous.

ARTIFICIAL RESPIRATION

The Schafer Prone-Pressure Method

Breathing ceases in an asphyxiated person before the heart stops beating—often some time before. In the precious time interval between the cessation of breathing and the cessation of the heartbeat, there is a good chance of saving the victim's life if you act promptly to restore breathing. The method of doing this is called artificial respiration. When the victim of an accident has stopped breathing, commence artificial respiration without delay. If a helper is present, he may be sent first to summon a physician and then return to assist the first-aid operator.

1. Turn the victim over on his belly on the ground, preferably with his head slightly "downhill," with one arm extended directly overhead and the other arm bent at the elbow, and with the face turned outward and resting on the hand and fingers of the bent arm so that the nose and mouth are free for breathing (Figure 6). Quickly make sure that there is nothing to block the passage of air into and out of the lungs. Obstructions to note and remove are any constriction about the neck; tight clothing about the neck, chest, or waist; or objects in the mouth, such as chewing gum or displaced false teeth.
2. Kneel straddling the victim's thigh on the side toward which the face is turned, so that you can watch it. Place your knees at the distance from the victim's hipbones which will allow you to lean forward and place the palms of your hands on the small of his back with your fingers resting on his ribs, the little finger of each hand just touching the lowest rib. Your thumb and fingers should be in a natural position with the tips of your fingers just out of sight around the curve of the victim's body (Figure 6).

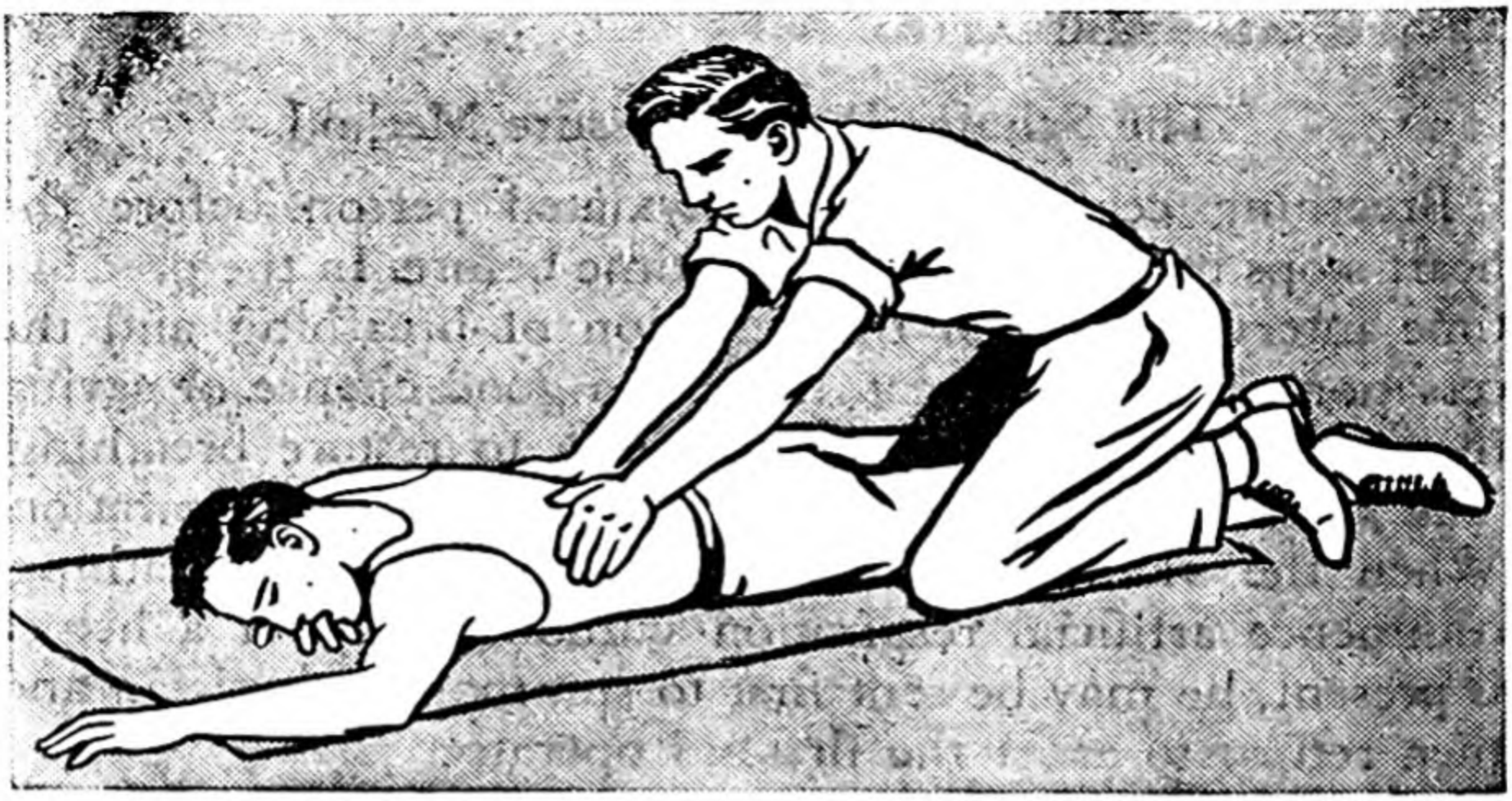


Figure 6

3. With your arms held straight, swing forward slowly, and gradually bring pressure to bear upon the victim. Your shoulder should be directly over the heel of your hand at the end of the forward swing (Figure 7). Do not bend your elbows. Time the forward swing to take about two seconds by counting slowly *one, two.*

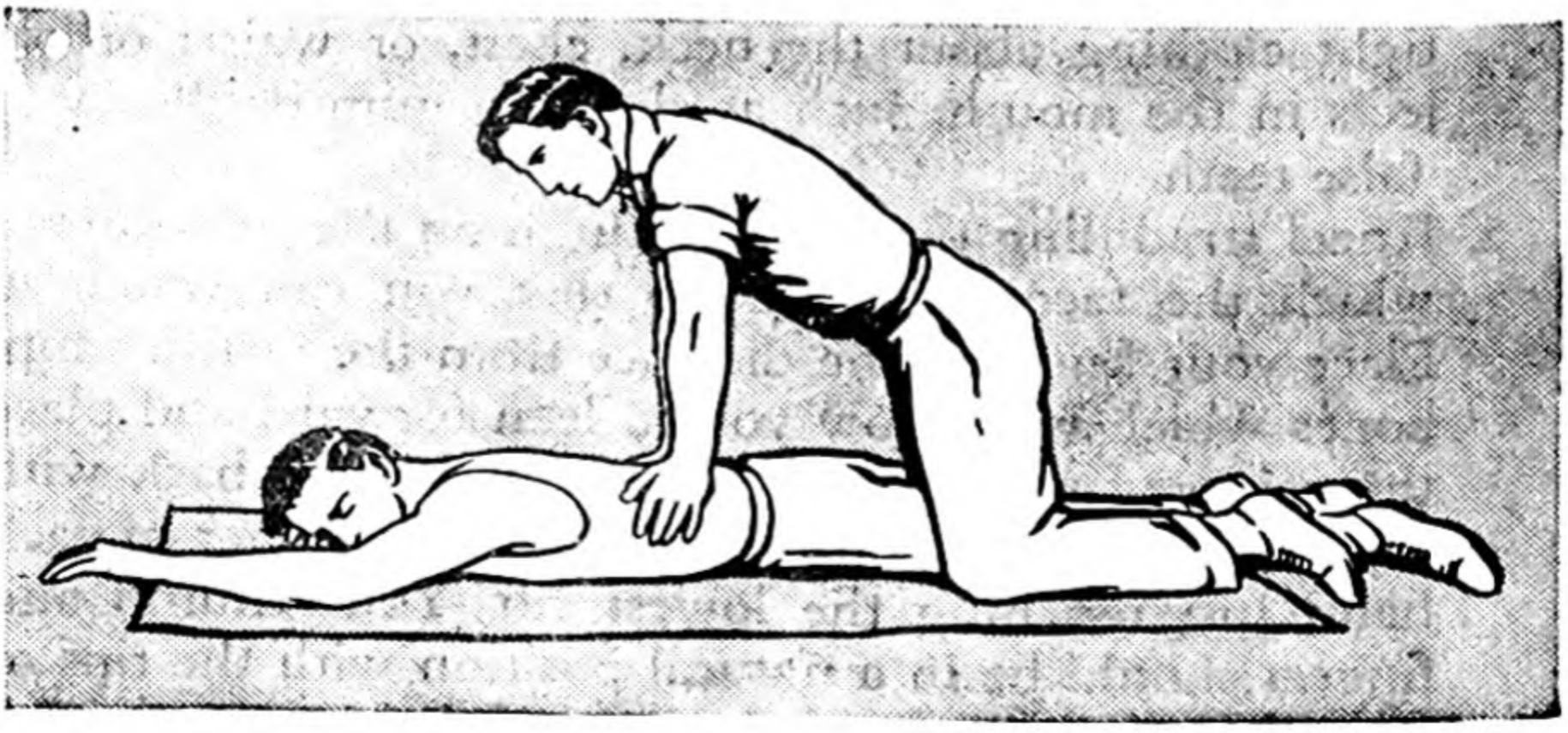


Figure 7

4. Immediately swing backward so as to remove the pressure completely (Figure 8*b*).

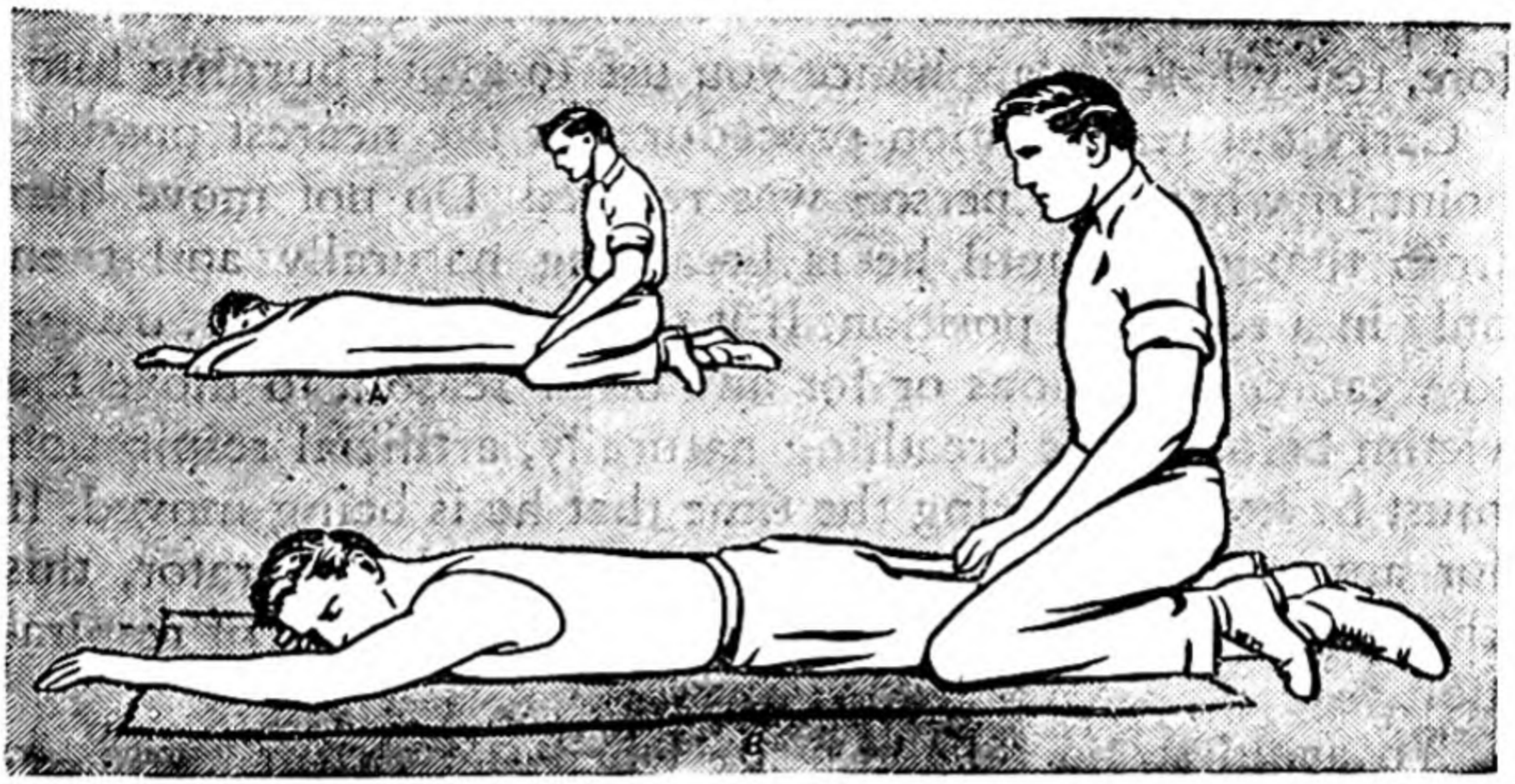


Figure 8

5. After the lapse of two seconds (count slowly *one. two*), swing forward again. Repeat unhurriedly from 12 to 15 times a minute the double movements of exerting pressure and releasing pressure. Each double movement makes one complete respiration—forcing out and drawing in air—every 4 or 5 seconds, the rate of normal quiet breathing.

Continue artificial respiration *without interruption* until the victim breathes naturally; if necessary four hours or longer, or until a physician pronounces the victim dead.

While administering artificial respiration, *the victim must be kept warm*. An unconscious person rapidly becomes chilled, and chilling causes a further drain on his vitality. Pneumonia frequently develops in a victim of submersion, electric shock, or gas asphyxiation, chiefly because he was not protected from the cold while efforts were made to revive him. Spread coats or blankets over and under the victim (Figure 8*a*) and, in a cold environment, use external

heat in the form of hot-water bottles, chemical heating pads, or hot bricks or stones wrapped in newspaper. Remember that an unconscious person cannot feel the heat; therefore, test whatever appliance you use to avoid burning him.

Carry out resuscitation procedures at the nearest possible point to where the person was rescued. Do not move him from that place until he is breathing naturally and then only in a reclining position. If it should be necessary, owing to weather conditions or for any other reason, to move the victim before he is breathing naturally, artificial respiration must be kept up during the time that he is being moved. If for any reason it is necessary to change the operator, this change must be made without losing the rhythm of respiration.

To avoid strain on the heart when the victim begins to breathe naturally, keep him lying down. Do not allow him to sit up or stand up. If the physician has not arrived by the time the victim has revived, give a stimulant, such as a half teaspoonful of aromatic spirits of ammonia in a small glass of water or a drink of hot, sweetened coffee or tea. Do not give an alcoholic beverage. *Do not give any liquids whatever by mouth until the person is fully conscious.*

Not infrequently the victim starts to breath naturally and then stops breathing. For that reason watch him closely, and if natural breathing stops after a temporary recovery, resume artificial respiration at once.

Usually it is necessary to continue treatment for shock (see Shock, pages 95-98) long after the victim begins to breathe. Never leave him alone until you are sure that he has fully recovered.

In practicing artificial respiration it is important to imitate as nearly as possible actual situations in which it may be necessary to carry out resuscitation measures—in a boat, for example. After the basic procedure has become thoroughly familiar through practice, the student should learn to ad-

minister artificial respiration while the person taking the part of the victim is swathed in blankets.

Oxygen-Carbon Dioxide Inhalator

The recovery of a victim of gas asphyxia is hastened by the administration of a mixture of oxygen and carbon dioxide in the proportion of 93 parts oxygen and 7 parts carbon dioxide. This mixture is helpful even for gas-poisoning cases in which natural breathing has not stopped. As previously explained, carbon dioxide stimulates the respiratory center in the brain to step up the ventilation of the lungs by promoting faster, deeper breathing. Thus, a little carbon dioxide mixed with pure oxygen helps to stimulate breathing while the oxygen is driving the poisonous gas from the blood.

The use of oxygen or of the oxygen-carbon dioxide mixture may also hasten recovery and help to prevent relapses in cases of submersion, electric shock, or other conditions causing asphyxia. However, in no case can it restore natural breathing. If an inhalator has been sent for from the fire department, police department, local gas and electric company, or a hospital, do not wait for it to arrive. Begin artificial respiration by the prone-pressure method at once.

After the inhalator has arrived, remember that it cannot make the victim start breathing. With the mask of the inhalator in place over the victim's face, artificial respiration must be continued until the victim breathes naturally. Then he should be allowed to continue breathing naturally through the inhalator until he is fully conscious and can speak and, when spoken to, reply intelligently. As he may stop breathing again he should be observed closely.

BLEEDING

BLEEDING may be (1) to the outside from severed or punctured blood vessels in the limbs or in the tissues of the head and trunk which are relatively close to the surface, or (2) to the inside from an internal injury which causes blood to be discharged into internal organs or cavities of the head, chest, or abdomen. The first type of bleeding is called external bleeding, or hemorrhage. It is directly visible or readily identified by the seepage of blood through the clothing. The second type of bleeding is called internal or concealed bleeding.

In either case, bleeding, if it is extreme or allowed to continue, causes the following signs and symptoms:

1. Giddiness and weakness, made worse by sitting up or standing up.

2. Pallor of the face and lips and coldness and clamminess of the skin. The face may look "pinched."

3. Quick, feeble pulse which may be hard to find at the wrist.

4. Hurried, labored breathing with possible sighing or yawning.

5. Thirst; dimmed, blurred sight; dulled hearing, with "singing in the ears."

6. Restlessness and anxiety. The victim may tug at the clothing around his neck or throw his arms about. In the absence of visible bleeding, this restlessness, which is due to "air hunger," serves to distinguish the case from one of pure shock. The purely shocked person is apathetic and lies still.

All these signs and symptoms are evidence of progressive decrease in volume of the circulating blood with a consequent lowering of blood pressure, oxygen starvation, and shortage of moisture.

EXTERNAL BLEEDING

Although it is customary to classify external bleeding as arterial, venous, and capillary, it is very seldom that bleeding from one type of vessel alone is seen. A serious wound usually bleeds from capillaries, arteries, and veins at the same time, since the wound-producing agent is not a surgeon and thus no respecter of blood vessels as it cuts or tears down through skin, subcutaneous tissue, fat, and muscle. It is essential in giving first aid that all bleeding be stopped as soon as possible. During the process, the victim should lie flat on the ground or floor with blankets or coats under him and over him. An injured limb should be elevated, as this position helps to control bleeding from a vein in an arm or leg.

The three ways in which bleeding may be controlled are: (1) by a pressure bandage, (2) by digital (finger) pressure on the appropriate pressure point, and (3) by a tourniquet.

If these methods fail or for any reason cannot be applied, do not hesitate to press with the thumb, fingers, or hand directly over the bleeding point.

When an artery is cut—

The blood is scarlet and spurts out in jets from the end of the vessel nearest the heart. The jets keep time with the beats of the heart.

When a vein is cut—

The blood is dark red and flows in a sluggish stream from a large vein, wells up from a small one. The blood comes from the end of the cut vein farthest from the heart.

When capillaries are cut—

The blood comes in a brisk free stream from points all over the injured part.

WHEN BLEEDING IS NOT SEVERE

Control of Bleeding by Pressure Bandage

As a rule, bleeding which is not severe can be controlled by placing a compress (pad of sterile gauze, clean handkerchief, or similar material) over the wound and applying pressure by means of a bandage or adhesive-tape strapping. If the pressure bandage does not control the bleeding, hand pressure applied on the compress directly over the wound may stop it. When bleeding has been controlled by a pressure bandage, do not remove the dressing if it soaks through. By doing so you will disturb the blood clots which are forming and may hurt the patient, thus increasing the danger of

shock. Put another dressing on top of the first one and bandage tightly.

Pressure Bandages*

Extremities. 1. Place a compress over the wound. 2. Place the center of a cravat bandage over the compress. 3. Carry the ends around the injured limb and cross on the side opposite the wound. 4. Bring the ends back to the wound side and tie firmly over the compress.

Forehead or scalp. 1. Place the center of a cravat bandage over the wound compress. 2. Carry the ends to the side of the head opposite the injury. Cross the ends (pulling the bandage quite tight if necessary), and bring back to tie over the compress. Use this bandage for any wound in the area covered by the bandage, first covering the wound with a compress.

Chest or back. Place a sterile compress over the wound. Place the center of a wide cravat over the compress. Carry the ends across the back and chest and tie on the opposite side. If the wound is on the chest or back above the armpits, pass one end of the bandage under the armpit and the other end across the opposite shoulder, and tie.

WHEN BLEEDING IS SEVERE

Control of Bleeding by Digital Pressure

If bleeding is extremely severe with a spurting flow, indicating that a major artery has been cut, bleeding may be arrested or controlled by pressing upon the nearest pressure point between the wound and the heart. A pressure

* See also Bandaging, in Part III.

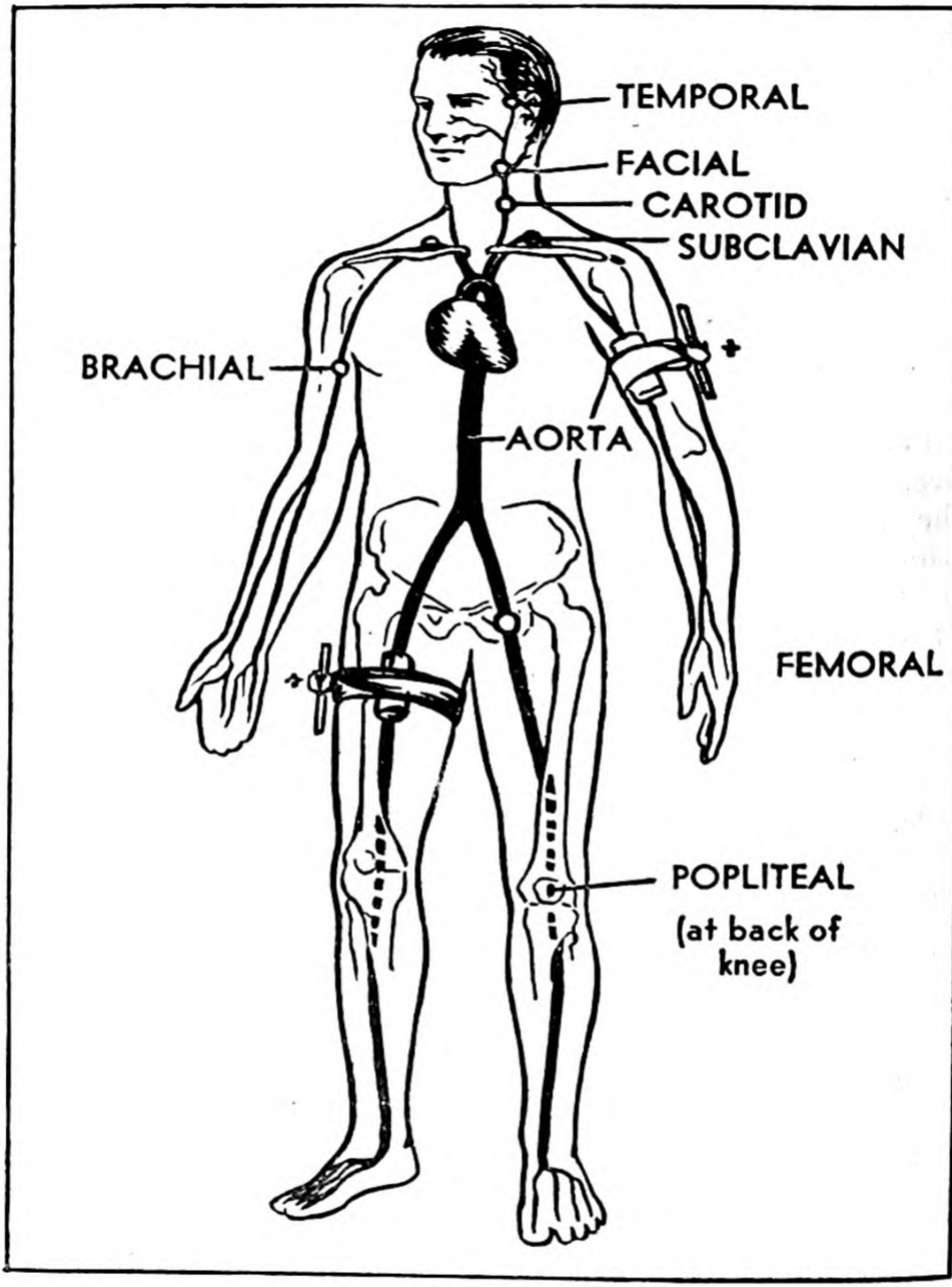

TEMPORAL
FACIAL
CAROTID
SUBCLAVIAN
BRACHIAL
+
AORTA
FEMORAL
POPLITEAL
(at back of
knee)

Figure 9

point is a point on the body at or near the point where an artery crosses a bone. Digital (finger) pressure at a pressure point shuts off the artery just as stepping on a rubber hose lying on the ground will shut off the hose.

Pressure Points for the Neck and Head

Blood is carried to the neck and head from the trunk by the two carotid arteries and their branches. The carotids ascend the neck obliquely on each side of the windpipe and may be compressed against the spinal column. Bleeding from a severed or punctured carotid is the swiftest of all arterial bleeding. It occurs when the neck or throat is cut or punctured.

For bleeding from the neck or throat: Press inwards and backwards below the wound at the lower border of the Adam's apple, with the thumb against the neck vertebrae and the fingers against the side of the windpipe (*not over it*). Exert pressure from fingers to thumb (Figure 36, page 133). Keep up digital pressure by relays of assistants. If the jugular vein is also wounded, apply pressure above the wound with your other thumb. The jugular vein runs alongside the carotid artery on each side of the neck.

For bleeding above the level of the eyes, press one finger's breadth in front of the ear opening (Figure 34, page 132). Pressure at this point compresses the temporal artery (a branch of the carotid) against the skull.

For bleeding of the face below the level of the eyes, press in the notch on the side of the jawbone which is one inch to one and one half inches in front of the angle of the jaw (Figure 35, page 132). Pressure at this point compresses the facial artery (another branch of the carotid) at the point where it crosses the lower jaw.

Pressure Points for the Shoulder and Arm

The long trunk artery which carries blood to each arm is given different names according to the region through which it passes. The first portion which passes a short way up into the neck and then turns downward to rest on the first rib is called the subclavian artery.

Bleeding from the shoulder, armpit, and upper part of the arm is controlled by compressing the subclavian artery against the first rib. Place your thumb or fingers in the hollow ("bird's nest") behind the collarbone and press against the upper surface of the first rib (Figure 37, page 133). In addition to pressure on the subclavian, it may be necessary to push a cloth pad into the armpit and bind the arm to the side. This compresses the axillary artery, a continuation of the subclavian.

Bleeding from lower two thirds of the arm, and hand is controlled by compressing the brachial artery (a continuation of the axillary) against the upper armbone (the humerus). With the fingers on the inside of the arm and the thumb on the outside about halfway between armpit and elbow, press your fingers and thumb toward each other with the armbone between, thus compressing the brachial artery against the armbone (Figure 38, page 134). If the arm is fat, place your hand underneath it with the thumb on the inside of the arm and the fingers on the outside.

Bleeding from the palm of the hand may be controlled by placing a firm object covered with sterile gauze in the center of the palm, closing the fingers over it, and binding firmly to keep the fist closed.

Pressure Point for the Lower Limb

The upper portion of the large trunk artery which extends downward to each lower limb is called the femoral

artery. It lies in the upper three quarters of the thigh. The circulation of blood through the femoral artery can be most easily controlled by pressing with the heel of the hand or the closed fist in the middle of the depression on the inner side of the thigh. This depression, known as the femoral triangle, is just below the fold of the groin. Pressure at this point controls *bleeding from the thigh, leg, or foot* (Figure 39, page 134).

While bleeding is being controlled by pressing upon the appropriate pressure point, have an assistant place a compress over the wound and bandage it tightly in place. Then release the pressure point and watch to see whether severe bleeding will recommence. As a rule, the compress and bandage or hand pressure over the compress will control the bleeding. *Only if absolutely essential should a tourniquet be applied.*

Control of Bleeding by Tourniquet

A tourniquet is often applied to stop violent arterial bleeding, but it is not advocated as the first thing to do in the majority of cases. Arteries have elastic coats, and when cut right across, they contract and may curl up at the ends, thus preventing a too-great loss of blood. In torn, or lacerated, wounds, crushing the arteries may effectively seal them off. Furthermore, the drop in blood pressure which occurs in severe bleeding or shock may give the blood at the cut ends of the arteries a chance to clot, which would not happen if the pressure of the blood within the arteries were stronger. These self-protective devices may control the bleeding to such an extent that digital pressure followed by bandage pressure may be all that is needed.

However, there are undoubtedly cases of arterial bleeding in which a tourniquet is imperative. Cases of this kind include the tearing off (accidental amputation) or mangling of portions of limbs, and wounds in which the muscular action of the coats of an incompletely severed artery tends

to widen the gap in the blood vessel as the blood pulses through it.

How To Apply a Tourniquet

The two places where it is safest and most convenient to apply a tourniquet are (1) around the upper arm about a hand's breadth below the armpit and (2) around the thigh at about a hand's breadth below the groin. However, if there is a chance that victims of a major catastrophe (such as a severe air raid) will not reach a hospital or receive medical attention for some hours, it is considered safest to apply the tourniquet, when necessary, around a pad over the wound or at the immediate upper extremity of the wound. Then, if amputation below the level of the tourniquet is necessary, a larger portion of the limb may be saved.

A tourniquet should be a fairly wide band long enough to go twice around the limb, with ends left for a knot. A narrow cravat bandage is best, but any material such as a necktie, towel, or strips torn from clothing or from the inner tube of an automobile tire will do. The tourniquets in first-aid kits usually consist of a strap with a buckle.

A cloth pad, such as several thicknesses of gauze or a folded handkerchief, should be placed under the tourniquet directly over the artery at the pressure point. This serves to protect the artery and at the same time to distribute the pressure evenly.

To apply the tourniquet, wrap it at least twice around the limb and tie it with a half knot. Then place a small stick over the half knot and tie a square knot over the stick. Twist the stick rapidly to tighten the tourniquet until the bleeding stops. *Do not twist too hard—just enough to stop the bleeding.* At the end of the final twist the stick should be parallel with the limb so that it can be tied in place with the ends of the tourniquet band or with a second cravat bandage or handkerchief looped over the end of the stick and tied around the limb. (See Figure 10.)

Release the tourniquet every fifteen minutes, but do not remove it. The object of this is to allow blood to circulate through the limb below the tourniquet. Gangrene may develop if the blood supply of the limb is blocked off too long. While the tourniquet is being loosened, press with the hand over the compress covering the wound to control bleeding. If severe bleeding does not start again, within one minute after loosening the tourniquet, do not retighten it but leave it in place, ready to retighten in case the bleeding returns.

Do not hide a tourniquet under bandages, clothing, or blankets where in the stress of the moment it may be forgotten. Always tell the physician when he arrives that a tourniquet has been applied.

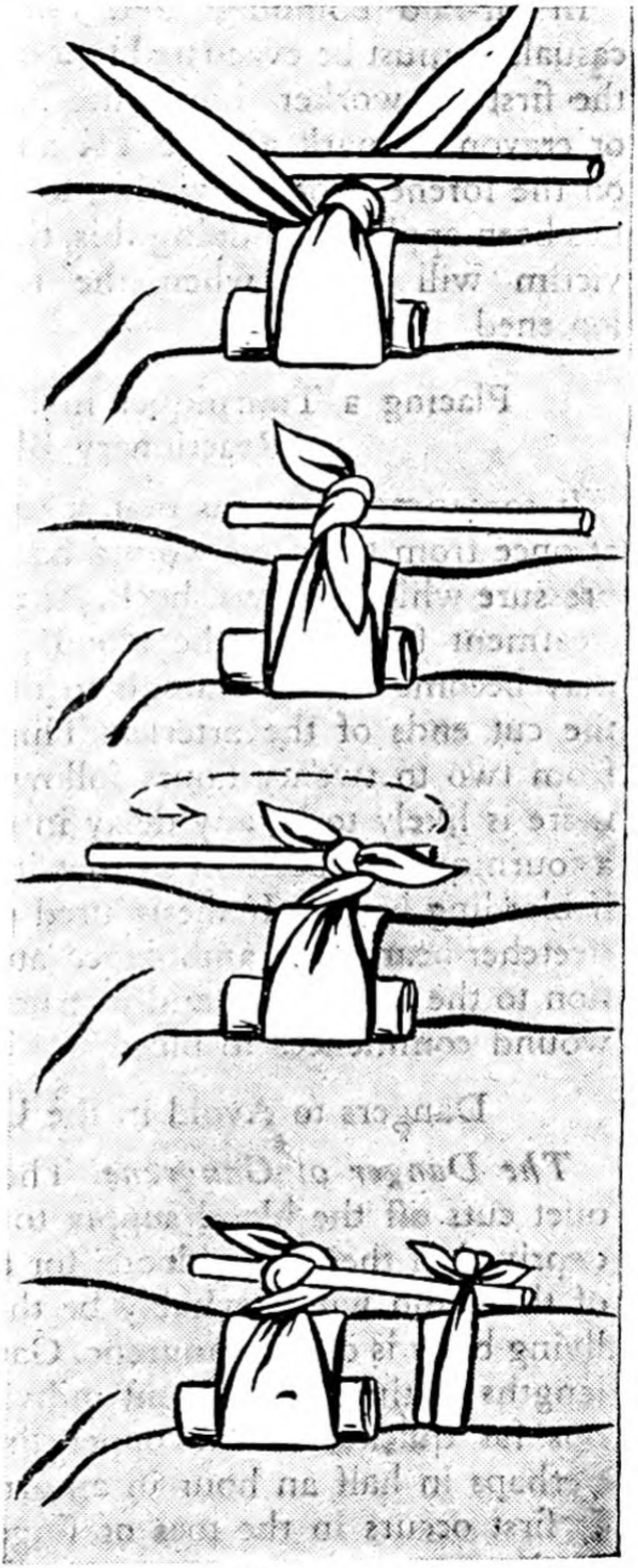


Figure 10

In air-raid bombings and other disasters when many casualties must be evacuated to a casualty station or hospital, the first-aid worker should use lipstick, iodine, soft pencil, or crayon to mark a large TK and the time of application on the forehead of the victim, to indicate that a tourniquet has been applied. By doing this, the persons in charge of the victim will know when the tourniquet must next be loosened.

Placing a Tourniquet in Position To Control Reactionary Bleeding

It sometimes happens that severe bleeding does not start at once from a serious wound because of the drop in blood pressure which follows shock. As the victim improves under treatment for shock, the blood pressure increases until it may become strong enough to dislodge the blood clots at the cut ends of the arteries. This may occur at any time from two to twenty hours following the injury. Hence, if there is likely to be any delay in getting medical aid, place a tourniquet in position so that it can be tightened at once if bleeding begins. If the injured person is put in charge of stretcher-bearers or ambulance attendants, call their attention to the tourniquet and instruct them to tighten it if the wound commences to bleed.

Dangers to Avoid in the Use of Tourniquets

The Danger of Gangrene. The application of a tourniquet cuts off the blood supply to a limb. If the tissues are deprived of their "life blood" for too long a time, the death of that limb will inevitably be the result. Dead tissue in a living body is called gangrene. Gangrene appears in varying lengths of time in different individuals. As a rule, it develops far quicker in the upper limbs than in the lower—perhaps in half an hour in an arm, in four hours in a leg. It first occurs in the toes or fingers and spreads upwards. If the toes or fingers are very dirty and the skin broken,

"wet" or infective gangrene may set in and infect the whole limb. Quick amputation by a surgeon is then the only measure which will save the victim's life.

The Danger of Injury to Nerves and Arteries. Nerves, arteries, and veins often travel in the same bundle. Pressing a nerve against a bone too hard may damage the nerve, causing temporary or permanent paralysis of the muscles. Too much pressure on an artery may injure its inner coats. That is why the pad placed under the tourniquet band should be firm but not hard. On the other hand, if the tourniquet slips or is not applied tightly enough, the superficial veins may be closed without closing the artery. In that case bleeding is increased instead of stopped.

Increased Liability to Shock. The application of a tourniquet may increase pain, and pain is one of the principal antecedents of shock.

Despite its disadvantages and dangers, the tourniquet has saved many lives and will save many more. The principal points to remember are:

1. Restrict the use of a tourniquet to obvious arterial bleeding (blood coming in spurts) which cannot be controlled by digital pressure over a pressure point or direct pressure over the wound.
2. Place the tourniquet in the proper position, tighten it just enough to stop bleeding, and loosen it every fifteen minutes.
3. Make sure that the physician, stretcher-bearers, or ambulance attendants know that a tourniquet has been applied—when and where.

Venous Bleeding

Bleeding from veins, including ruptured varicose veins, is much easier to control than is arterial bleeding because blood flows through the veins under much lower pressure than through the arteries. The first thing to do is to raise

the limb and remove any constriction on the heart side of the wound (for example, round garters). Then press with the fingers near the edges of the wound until a firm compress and bandage can be applied. If a pressure bandage alone does not stop the bleeding, press with the fingers over the compress. In severe venous bleeding, digital pressure over the proper arterial pressure point (pages 76-79) should be applied, as this will cut off the blood supply to the injured part.

Capillary Bleeding

In the great majority of cases capillary bleeding can be controlled by covering the wound with a sterile compress and applying pressure by means of the bandage holding it in place.

Internal Bleeding

Internal bleeding may be caused either by disease or accidental injury. In most cases of internal bleeding, the bowels, the lungs, or the stomach are the organs involved. Before there is any evidence of hemorrhage to indicate the source of internal bleeding, the following general symptoms are apt to be present: restlessness, anxiety, and thirst, with faintness, pallor, and a weak rapid pulse. The signs by which the source of the bleeding may be detected when they appear are as follows:

Bleeding from the bowels may occur in intestinal diseases, for example, dysentery and typhoid fever, or result from an abdominal injury such as a wound or a blow. If the bleeding is from the upper part of the intestinal tract, the blood in the stools resembles tar ("tarry stools") because it has been acted on by the digestive secretions of the small intestine. If the bleeding is from a point in the lower part of the intestinal tract, the blood is bright red.

Bleeding from the lungs may occur in tuberculosis or as a result of a puncture wound of the chest. The sharp end of a

broken rib driven into the lung causes bleeding from the lungs (see Ribs, Fracture of, page 212). Blood from hemorrhage of the lungs is frothy and bright red, and is usually brought up by coughing.

Bleeding from the stomach may occur as a result of stomach ulcers or a wound in the stomach. The action of the digestive juice secreted by the stomach (gastric juice) usually turns the blood dark brown and breaks it up into small clots resembling coffee grounds ("coffee-ground" vomit). In ulcer of the stomach, a copious hemorrhage of bright-red blood may occur.

First Aid. In all cases of internal bleeding, no matter what the cause, shock is the condition that requires first-aid care. Keep the victim lying on his back with his head turned to one side if he vomits or coughs, so that vomited matter will not flow back into his throat and choke him. In injuries of the chest with hemorrhage from the lungs, it may be necessary to elevate the chest and head high enough to enable the injured person to breathe.

Do not move the victim unless absolutely necessary and then only in a lying position. All handling and transport must be extremely gentle, with no jolts or jars.

Keep the victim warm with blankets, coats, or newspapers. *Do not give stimulants* or any other drink, even if he begs for it.

The victim is apt to be badly scared, especially in hemorrhage from the lungs or stomach. Since fright may make the bleeding worse, reassurement is always justified.

CHEMICAL POISONS SWALLOWED

A POISON taken by mouth is one of the emergencies which *require immediate first aid*. If the poison can be evacuated from the stomach before much of it has been absorbed, little harm may be done. But if it once gets into the blood stream, even a physician may be powerless to save a person's life.

The cause of poisoning may be accidental, criminal, suicidal, or industrial. The picture of a poisoning case is somewhat as follows. A person previously in good health becomes suddenly and violently ill and rapidly grows worse. There may be definite clues which suggest that a poison, and specifically what poison, was taken—for example, an empty or partly empty container of a poisonous substance in the medicine cabinet, room, or personal possession of the victim, or a child caught in the act of sampling rat poison or a poisonous cleaning substance.

The signs and symptoms may be similar to those known to be produced by some group of poisons—for example, stains and burns about the mouth, if a corrosive poison (strong acid or caustic alkali) was taken; drowsiness passing into extreme sleepiness and finally coma, if a narcotic poison was taken.

The victim may be able to volunteer information or answer questions which will throw light on his condition. For example: Did the symptoms appear a short time after swallowing some substance which had an unusual odor or taste? Was a poisonous substance mistaken for a medicine (a common cause of accidental poisoning)? In case of attempted suicide it may be very difficult to get the victim to admit what he took or to submit to first-aid measures.

First Aid in General

No time should be wasted in trying to find out what

poison was taken if this information is not at once forthcoming. Call a doctor, tell him what poison was taken if this is known, and then get busy.

Although every case of poisoning is in some points unique, there are certain first-aid measures which apply in all cases. These are especially important when the nature of the poison is unknown. The rapid action of most poisons means that whatever measures are taken *must be taken quickly*. The two most important objects of first aid are (1) *diluting and removing the poison* and (2) *rendering it harmless*. Since neither one can usually be attained absolutely, both should be tried at once.

Emetics

The dilution and removal of the poison from the stomach are accomplished by giving an emetic, even though vomiting has taken place spontaneously and even though several hours have elapsed since the poison was swallowed, as some poisons remain in the stomach for a long time. The only cases in which an emetic should not be given, or given very cautiously, are extensive corrosion of the tissues caused by swallowing a concentrated acid or caustic alkali. Violent vomiting in such cases may rupture the corroded walls of the esophagus and stomach.

Household emetics which are effective and easily and quickly prepared are:

Warm mustard water—one teaspoonful of dry mustard in one glass of tepid water
Warm salt water—one tablespoonful of salt in one glass of tepid water
Soapy water—a piece of mild soap shaken up in warm water to make good suds

If the patient has not vomited after swallowing several glassfuls of the emetic, tickle the back of his throat with a finger or a feather. Induce vomiting repeatedly until the

fluid coming from the stomach is clear.

If the doctor has not arrived by the time everything possible has been done to get the poison out of the stomach, a tablespoonful of Epsom salts in water should be given to clean the intestine of poisons which are absorbed slowly.

Antidotes

Rendering the poison harmless is accomplished by giving an antidote. Chemical antidotes are effective when the poison is in the alimentary canal, but with few exceptions are useless after the poison has been absorbed.

Since the presence of food in the alimentary canal hinders the action of antidotes and since the antidotes may not be completely effective, it is advisable to combine them with an emetic, either adding the antidote to the warm water used to induce vomiting or giving them in the intervals between vomiting. Like emetics, antidotes must be repeated frequently.

An understanding of the various ways in which antidotes achieve their effects may be helpful. Common antidotes classified according to the way in which they act are as follows:

Antidotes which either neutralize or destroy the poison.

Diluted alkalis, such as magnesia, soap, chalk, and baking soda, neutralize acids.

Weak acids, such as diluted vinegar and lemon juice, neutralize alkalis.

Oxidizing agents, especially a weak solution of potassium permanganate (roughly a penknife-pointful in a pint of water), destroy certain organic poisons such as morphine, strychnine, nicotine, and atropine.

2. *Antidotes which precipitate the poison, that is, cause it to drop out of solution so that it cannot be absorbed.*

An example is tannic-acid solution (a quarter teaspoonful of tannic-acid powder in water) or very

strong hot tea, which tends to precipitate various metallic poisons and a number of poisonous organic substances, such as morphine, strychnine, and digitalis. It is not always reliable but is harmless and does not interfere with other first-aid measures. It is chiefly used in combination with other measures, especially those taken to induce vomiting. The reason for this is that the precipitates formed are not quite insoluble, and must be got out of the stomach. Another precipitant antidote is raw egg white, which precipitates certain metallic poisons, especially mercury.

3. *Antidotes which act promptly to blot up (adsorb) many poisonous substances and so slow up or prevent their absorption by the body.*

Adsorbents are harmless in any case. The most effective adsorbent is "activated charcoal," or animal charcoal (boneblack), a tablespoonful in water before and after emptying the stomach by inducing vomiting. Raw eggs, starch in water, flour in water and milk hinder absorption less effectively than charcoal, but they are useful if the latter is not available. They also allay local irritation.

Demulcents

Demulcents are substances that soothe injured tissues. They are given after everything possible has been done to get a corrosive or irritant poison out of the stomach or counteracted. Milk, egg whites in water, and a thin paste of starch or flour make good demulcents.

Supportive Measures

What with the effects of the poison and the strenuous efforts made to get rid of it—efforts in which the victim must assist and work on himself by swallowing large volumes of emetic mixtures, vomiting, and drinking antidotal mixtures—he is bound to be exhausted when every-

thing possible has been done. To sustain his strength and prevent the development of shock, he must be kept warm and lying down. If he can swallow, a stimulating drink, such as hot coffee or tea, may be helpful. If breathing ceases, artificial respiration must be started at once.

In the first-aid handling of a case of poisoning by mouth, nothing should be destroyed or thrown away which might help to explain the accident at a subsequent enquiry. It is the responsibility of the first-aid worker to take possession of all foods, medicines, vomited matter, feces, urine, soiled clothing and towels, cups, spoons, glasses, and dishes until they can be handed over to the proper authority.

CLASSIFICATION OF POISONS

The more common poisons grouped according to their effect on the body and their most distinctive signs and symptoms are as follows:

For means of recognition of poisoning by a number of specific poisons and details of first aid, see the Poison Table on pages 250-266.

CORROSIVES

Effect on Body. Corrosive poisons rapidly destroy the body tissues with which they come in contact. For the most part they are strong acids, such as hydrochloric acid, and strong alkalis, such as caustic soda.

General Signs and Symptoms. Characteristic stains about the lips, mouth, and tongue, possibly stains on the clothing. Burning pain in the mouth, throat, esophagus, and stomach. Vomiting; rapid, feeble pulse; diarrhea, colic, and collapse. The face expresses anxiety and great suffering.

IRRITANTS

Effect on Body. Irritant poisons do not immediately destroy body tissues but cause severe inflammation at the point of contact. For the most part they are metals and salts of

metals such as arsenic, bichloride of mercury, iodine, and phosphorus.

General Signs and Symptoms. Gagging and vomiting; internal pain and cramps in abdomen; intense thirst; rapid, feeble pulse; diarrhea; gradual exhaustion, collapse, and possibly coma. The vomited matter and stools may contain blood.

NARCOTICS

Effect on Body. Narcotics are classed as neurotic depressant poisons because they have a depressing effect on the nervous system. Neurotic depressants are for the most part sleep-inducing and pain-relieving drugs, such as opium and its preparations, headache remedies, barbital (veronal), chloral hydrate, and phenobarbital (luminal).

General Signs and Symptoms.

Stage 1. Period of exhilaration followed by headache, drowsiness, rapid pulse and breathing, face flushed.

Stage 2. Sleepiness, but patient can be roused; pulse slow, breathing quiet, face pale, sweat on forehead.

Stage 3. Collapse, coma, pulse feeble, breathing stertorous, muscles relaxed, body cold.

NEUROTIC EXCITANTS

Effects on Body. Drugs of this class produce symptoms of irritation of the nervous system followed by symptoms of nervous and circulatory depression. Examples are aconite, wood alcohol, atropine, camphor, cocaine, poisonous mushrooms, and strychnine.

General Signs and Symptoms. At first, restlessness and nervous excitement; rapid, weak pulse, rapid breathing, flushed face; later, muscular twitching, delirium, and convulsions; perhaps still later, coma. Some poisons of this class also cause vomiting and diarrhea.

SHOCK

SHOCK is a most serious condition, characterized by a failure of vitality, which may result in complete prostration and even death.

Primary Shock. Primary shock occurs at the time of the injury. It is thought to be caused by the effects of pain and strong emotion on the nervous system. The immediate reaction of the outraged nerve cells is a widespread tightening up of the smaller blood vessels near the surface of the body —a sort of instinctive drawing inward out of harm's way of the vital fluid upon which all life processes depend. Most people know from experience what primary shock is like—the shaky knees, the feeling of nausea, the all-gone sensation at the pit of the stomach, the breaking out of sweat on the forehead and palms of the hands, the blanching of the face which one can almost feel before being told, "You're as white as a sheet," the trip-hammer beat of the heart. These symptoms develop instantaneously even after such comparatively minor injuries as a severely turned ankle, a pinched finger, or a mashed thumb. Primary shock does not last very long and usually needs no treatment other than a short rest.

Secondary Shock. When speaking nonspecifically of shock, secondary or delayed shock is usually meant, and most of the experimental work on shock has been directed toward an understanding of its cause and mechanism. It is a far more serious affair than primary shock—a calamity that surgeons and nurses take the utmost precautions to avoid

after surgical operations and see too much of in the victims of accidental injury. Next to stopping severe bleeding, restoring respiration after it has ceased, and getting a swallowed poison diluted and out of the stomach, the prevention or treatment of shock is the most urgent duty of the first-aid worker. Occupied with the obvious damage—the broken bone, the serious wound, the third-degree burn, for example —the collapse of the victim within a period varying from a few minutes to three or four hours after an injury may come as a surprise to the unprepared worker. That is why *shock always should be expected* and measures taken to avert it in victims of serious accidents.

A description of what happens in the body when shock occurs helps to explain why it may be fatal. This does not mean that the cause of shock is known. There is widespread disagreement among scientists on this point, but the principal physiological changes which take place are generally agreed upon:

1. First and foremost there is stagnation of blood in the capillaries, principally in those in the organs of the abdomen. Normally large numbers of capillaries are not in use or take turns in carrying blood. Some open for a time and then close down so that no blood runs through them, while others near by open to serve the neighborhood. In shock the capillaries lose their normal tone or strength, with the result that large numbers in the capillary beds in the abdomen which are officially off duty open up and fill with blood.
2. Since there is more space in the capillary beds for blood to occupy, there is less blood to return to the heart by way of the veins, and so the output of blood from the heart by way of the arteries is reduced.
3. With less blood in circulation the tissues do not get enough oxygen. The effect of oxygen lack on the capillary walls is to make them more than usually

permeable, with the result that blood plasma leaks out into the tissues.

4. A loss of blood plasma causes an actual reduction in the volume of the circulating blood. It also causes the concentration of blood corpuscles, which is characteristic of shock.
5. Thus there is set in motion a self-perpetuating vicious cycle which leads to the condition known as shock.
6. Early in shock the smallest arteries (arterioles) are constricted to maintain blood pressure at its normal level. Later the return of blood to the heart via the veins and the output of blood by the heart become so small that the most extreme contraction of the arterioles is unable to maintain arterial blood pressure and the blood pressure falls.

Signs and Symptoms. Indications of shock are all traceable to the events which take place in the body when shock occurs.

1. *The pulse is small and weak* because too little blood is returned to the heart by the veins to fill it to capacity before each beat, and later becomes rapid and irregular because the heart tries to make up for the decreased volume of blood in circulation by pumping what there is around faster.

Practically all the other symptoms are produced by the decrease in the amount of blood circulating in the tissues and the resulting radical cut in their oxygen supply. Since the nervous system suffers most from a lack of oxygen, many of the symptoms of advanced shock resemble those of nervous exhaustion.

2. *The face is pale* and often clammy with cold sweat, especially on the forehead.

3. The body is cold, especially at the extremities. A severe "shaking" chill sometimes develops, and nausea or vomiting frequently occurs.

4. Usually there is an abnormal exaggeration of the movements of breathing—long, deep gasping breaths followed by shallow ones.

5. The patient becomes weak, dull, apathetic, and listless. He takes little interest in what goes on around him. It is difficult to get him to answer questions. He may complain of being very tired or cold. If there is severe, uncontrolled internal or external bleeding, he is often restless from "air hunger."

6. Finally, in severe cases, he may lapse into complete unconsciousness.

First Aid

The conditions which are liable to produce secondary shock or cause primary shock to merge directly with its far more dangerous and longer-lived successor are (1) loss of body heat, (2) reduction in the amount of blood in circulation, and (3) pain. The onset of secondary shock can to a great extent be prevented, or its severity lessened, not only by the suitable care of a person in primary shock, but also by continuing to observe simple precautions after the effects of primary shock have worn off. The simple first-aid methods of dealing with primary shock and preventing secondary shock are best considered with reference to the contributing causes.

1. *Loss of body heat.* Persons going into shock usually have cold extremities or complain of feeling cold. The reason for this is that the amount of blood flowing to the extremities is greatly reduced.

   To prevent the further dissipation of body heat, place double thicknesses of blankets, coats, newspapers, or any other warm material available *below and above* the patient. Make sure that there are no large openings in

between the blankets for heat to get out or for moving air to get in and conduct heat away from the body.

Provide external heat also if the injured person continues to feel cold in spite of blankets, or if the environment is so cold that a normal person in a recumbent position would require a hot water bottle or heating pad in addition to blankets. If artificial heat is used, always test the heating agent by holding it against your cheek or elbow and wrap it with cloth or newspaper. A patient in shock is easily burned, as his sense of pain is dulled.

2. *Reduction in the amount of blood in circulation.* To combat this—the precipitating cause of shock—it is necessary to deal promptly with all sources of loss of fluid from the body and to encourage by gravity the flow of blood toward the heart and brain. Not only check severe, profuse bleeding, but also watch for and control the oozing of blood as from a shallow wound in a fleshy part of the body and the discharge of watery serum from a burned or scalded area. Of course, only external bleeding can be controlled by the first-aid worker. Except in nosebleed, external bleeding comes from a visible wound.

To keep as much blood in circulation as possible by encouraging the return flow of blood to the heart, place the victim on his back with his head low, unless there is a head injury. In that case, raise his head slightly or keep him lying flat. If he has anything in his mouth, such as removable false teeth, chewing gum, or tobacco, which might choke him, be sure to remove it.

Lowering the head is best accomplished by raising the foot of whatever the injured person is lying on about eighteen inches higher than the head. If the victim is on the ground, elevate his feet, legs, and thighs by pushing folded blankets, coats, or pillows under them. Do not let him sit up or place a pillow

under his head until it is reasonably certain that shock will not develop.

If the victim is conscious, a stimulating drink, such as hot, sweet coffee or tea, given a teaspoonful at a time, is often helpful in conserving body heat and in returning fluids to the body *after bleeding has been checked*. But remember that no stimulants may be given before bleeding has been checked or in cases in which internal hemorrhage, skull fracture, or abdominal injury is present or suspected. If there is a wound near or about the abdomen, do not allow drinks, not even a sip of water, even if the patient begs for one. Stimulants strengthen the action of the heart and will indirectly increase the volume of blood escaping from a punctured blood vessel or cause the rupture of weakened blood vessels through increased pressure on their walls, just as anything that makes a water-pump pump faster will increase the amount of water escaping from a leak in a hose attached to it or will cause a leak if the hose is weak at one or more points.

Stimulants must not be poured into the mouth of an unconscious person for fear of choking him, but smelling salts or a handkerchief wet with diluted household ammonia or aromatic spirits of ammonia may be held under his nose. Do not hold the inhalant too close to the nose or mouth, as this may cause gagging or temporary strangulation.

3. *Pain.* A severely injured person is bound to suffer great pain if he is handled clumsily or incorrectly or moved in a hurry without properly protecting the injured parts. Pain is an important—some authorities say the *most* important—contributing factor in the development of shock. Thus one of the greatest lifesaving contributions the first-aid worker can make is to see that an injured person is handled, lifted, and moved gently and skillfully. Fractures must be immobilized;

suitable first-aid dressings, including the covering of burned areas, must be applied; the injured person must be placed in the appropriate posture on the stretcher, with the injured parts suitably supported; the stretcher-bearers must avoid jerks and jars; and the ambulance drivers must forgo their theatrical "rush to hospital," especially if there are any "bumps" along the way.

Since fear or any other strong emotion, as well as pain, favors the development of shock, everything possible should be done to reassure the injured person. If possible, keep him from learning the nature and extent of his injuries, and do not harass or alarm him with unnecessary questions or fussing.

PART III

First Aid from A to Z

A

ABDOMEN, PAIN IN. *See* Appendicitis.

WOUND IN. *See* Abdominal Wounds, pages 320-321.

ABRASIONS

AN abrasion is a shallow wound caused by the rubbing or scraping off of the upper layers of the skin, leaving a raw bleeding surface. It easily becomes infected if not treated properly, owing to the amount of underskin tissue exposed.

What to Do. If dirt is in the wound, wash it out gently with sterile gauze wet with boric-acid solution (two teaspoonfuls of boric-acid crystals in a glass of water) or alcohol (70% solution). Use a fresh piece of gauze for each swabbing and swab away from the wound. If bits of dirt stick, pick them out with small forceps (tweezers), the tips of which have been boiled or passed through a flame. Then paint the abrasion and surrounding skin with iodine (2% solution). When dry, apply a sterile gauze compress held in place with adhesive tape. For a severe abrasion, or one in which dirt or gravel is "ground" into the flesh, see a physician.

ACETANILID POISONING. *See* Poison Table, page 250.

ACETOPHENETIDIN (Phenacetin) **POISONING.** *See* Poison Table, page 250.

ACID, BURNS. *See* Burns, Chemical.

IN EYE. *See* Eye, Chemicals In.

POISONING. *See* Poison Table, page 250.

ACONITE POISONING. *See* Poison Table, page 250.

ADAMSITE (an irritant smoke used in chemical warfare). *See* pages 341-342.

ALCOHOL, METHYL (Wood Alcohol) POISONING. *See* Poison Table, page 251.

ALCOHOLISM

Cause. When taken in excess, ethyl alcohol (the intoxicant in whisky, gin, brandy, and other alcoholic drinks) acts as a poison, particularly on the nervous system, to produce partial or complete unconsciousness and sometimes delirium and collapse.

Signs. The victim is in a deep sleep with stertorous breathing which later becomes shallow. However, even if he is "dead drunk" he can be aroused slightly, unless he is suffering from collapse. His face is flushed and moist in the early stages, but later turns pale and dry. His pulse rate is at first strong and later becomes weak and rapid. The pupils of his eyes are natural or dilated but equal in size.

Usually there is an odor of the alcoholic drink on the breath. It is important to remember, however, that a person who has been drinking may become unconscious from some other cause besides drunkenness—for example, atropine or belladonna poisoning, apoplexy, skull fracture, concussion of the brain, epilepsy, opium poisoning, and sunstroke. Therefore, the odor of whisky or gin is not an infallible sign of unconsciousness caused by too much alcohol. Always call a physician if a person who smells of an alcoholic drink has been in an accident, or if there is any possibility that the stupor may not be due solely to alcoholism. If the pupils of the eyes are uneven when compared with each other, brain injury must always be suspected.

What to Do. If you are sure that a person is in an alcoholic stupor, put him to bed and allow him to "sleep off" the effects of his "jag." If he is partially conscious and can swallow, recovery will be hastened by giving him an emetic to cause vomiting (a teaspoonful of salt or dry mustard in

a glass of lukewarm water, or one tablespoonful of sirup of ipecac). Afterward give a stimulant, such as strong coffee or aromatic spirits of ammonia, every fifteen minutes, and keep the victim warm.

Collapse may accompany a severe case of alcoholism. Signs of collapse are extreme pallor, very weak pulse, and profound stupor from which the person cannot be aroused. Call a physician, and while waiting for him, put blankets under and over the victim, apply external heat, and rub the limbs toward the body to stimulate the circulation.

Delirium tremens sometimes occurs after an alcoholic debauch. The victim has hallucinations—that is, imagines he is "seeing things." He alternates noisiness with quiet, violence with calm. His face is flushed and his speech rapid and incoherent or irrelevant. A person in delirium tremens is always difficult to control and may suddenly develop homicidal mania. Do not try to restrain a violent person by yourself unless you have learned how to do so. Either you or the person you are trying to restrain may get hurt. The best you can do is to remove everything with which the victim might injure himself or others and get help as quickly as possible by calling a physician, the neighbors, or the police. The best place for a person with delirium tremens is a hospital

ALKALI, BURNS. *See* Burns, Chemical, page 142.
POISONING. *See* Poison Table, page 251.
ALLONAL POISONING. *See* Poison Table, Barbiturates, page 253.
AMINOPYRINE (Pyramidon). *See* Poison Table, page 252.
AMMONIA POISONING. *See* Poison Table *under* Alkalis, Caustic, page 251.
AMPUTATIONS, ACCIDENTAL. *See* External Bleeding, page 79.
AMYTAL POISONING. *See* Poison Table *under* Barbiturates, page 253.
ANGINA PECTORIS. *See* Heart Attack.

ANIMAL BITES. *See* Bites, Animal.
ANKLE, BANDAGE FOR. *See under* Sprains, page 270.
FRACTURE OF. *See* Fracture, Ankle, page 199.
SPRAIN OF. *See* Sprains.
ANTIPYRINE POISONING. *See* Poison Table, Aminopyrine, page 252.

APOPLEXY

Apoplexy often follows vigorous exertion or strong emotion in an elderly person, but may occur at rest, after a meal, or at any other time. Apoplexy seldom attacks a person less than fifty years of age.

Cause. Apoplexy, or "a paralytic stroke" or "a shock," as it is sometimes called, is caused by the rupture of one or more blood vessels in the brain. The escaping blood forms a clot which presses on the brain. The results are loss of consciousness and often paralysis of the muscles on the side of the body controlled by the motor area of the brain affected.

Signs. The face is usually flushed but is sometimes ashen gray. The pulse is strong and slow. Breathing is "puffy" and snoring in type. The pupils of the eyes are unequal in size and one eyelid may droop. The mouth may be drawn or twisted to one side. Also, one side of the body may be paralyzed—that is, bereft of the power to move and to feel.

What to Do. Send for a doctor. Keep the victim lying down, with his head and shoulders raised by a pillow. If he vomits, turn his head to one side to prevent choking. Move his head very gently. Apply cold, wet cloths or an ice bag to his head. Keep him absolutely quiet and warm. If he must be moved, use extreme care. *Give no stimulants.*

APPENDICITIS, ACUTE

Cause. Inflammation of the appendix, a small organ located in the lower right quarter of the abdomen.

Signs and Symptoms. The onset of acute appendicitis is usually sudden. The early signs include mild to severe abdominal pain that generally grows sharper and stronger. The pain may alternately let up and recur. It is not always in the lower right side. It may occur in any part of the abdomen, especially at the beginning of the attack. Other signs are nausea, vomiting, fever, and tenderness on pressure over the region of the appendix.

What to Do. Call a doctor at once. Put the sick person to bed and keep him quiet. *Do not give him a laxative or an enema,* as this may cause the appendix to rupture. Do not give him anything to eat or drink. If the doctor wants his patient to go at once to the hospital for an operation, see that he gets there without delay. The operation to remove an unruptured appendix is, in skilled surgical hands, one of the safest of all operations. Taking a laxative and delay in getting to a hospital for an operation are the chief causes of deaths from appendicitis.

ARM, BANDAGE FOR. See Bandaging, page 108.
BLEEDING FROM. *See* Bleeding, pages 133, 134.
FRACTURE OF (broken arm). *See under* Fractures, page 195, for traction-fixation splints; page 191, for ordinary splints for forearm; page 190, for ordinary splints for upper arm.
ARMPIT, BANDAGE FOR. *See* Bandaging, page 109.
BLEEDING FROM. *See* Bleeding, page 133.
ARSENIC POISONING. *See* Poison Table, page 252.
ARSINE (a poisonous gas used in chemical warfare). *See* page 344.
ARTERIES, BLEEDING FROM, SIGNS. *See* page 74.
CONTROL OF BLEEDING FROM, BY:
BANDAGE PRESSURE. *See* page 74.
DIGITAL (FINGER) PRESSURE. *See* pages 132-135.
TOURNIQUET. *See* pages 79-83.
PRESSURE POINTS. *See* pages 76-79.

ARTIFICIAL RESPIRATION, Prone-Pressure Method. *See* pages 67-70.
ASPHYXIA. *See* Asphyxia, pages 65-66.

ASTHMA

Asthma is a condition in which the bronchial tubes are narrowed by the swelling of their mucous membrane lining or partially blocked by the spasmodic contraction of the muscles in their walls. As a result, normal breathing is impossible.

Cause. Usually asthma is an allergic reaction—that is, a disturbance which arises when a person is extremely sensitive to certain substances in the air, in the diet, or in the environment. It is now generally believed that the capacity for or a tendency to allergic asthma is inherited.

Signs. A person in an asthmatic attack has great difficulty in breathing. He wheezes, spits up mucous sputum, and has a spasmodic cough. In a severe attack he literally gasps for breath and may turn blue in the face. The attack frequently comes on suddenly at night.

What to Do. Send for the victim's physician. Prop the victim up in bed and see that he gets plenty of fresh air, but keep the room warm.

The physician usually can give immediate relief from the acute respiratory distress of asthma by giving a hypodermic injection of epinephrine. The effect of epinephrine, which is a preparation of adrenaline, is to shrink the lining of the bronchial tubes so that the plugs of mucus are loosened and may be expelled by coughing. Air can then freely enter the air sacs in the lungs.

The only hope of permanent relief for allergic asthma depends entirely upon the recognition of the offending substance (or substances) so that the victim can avoid it or be desensitized to it. This can be accomplished only by taking tests administered by a physician and then submitting to the treatment he advises.

ATROPINE POISONING. *See* Poison Table, page 253.

B

BABY, SUDDEN BIRTH OF. *See* Childbirth, Sudden.
BACK, BANDAGE FOR. *See* Bandaging, page 122.
BACK, BROKEN. *See* Spinal Fracture *under* Fractures, page 214.
BANDAGES, CRAVAT. *See* page 23.
ROLLER. *See* page 24.
TRIANGULAR. *See* page 23.

BANDAGING

To cover small wounds, like scratches, minor cuts, and burns of limited extent, a sterile compress fastened in place with adhesive is usually most satisfactory. The sterile bandage compress is practicable for larger wounds. It consists of a pad of sterile gauze several layers thick attached to the center of a strip of cloth. The pad is applied over the wound and bound in place with the bandage tails.

To hold the compress in place over extensive wounds and burns and for the additional protection of wounds covered with a pad of a sterile bandage compress or with gauze held in place with strips of adhesive, triangular and cravat bandages are used. In all cases, remember that the bandage is not applied directly over a wound or burn. A sterile compress—large enough to extend a little beyond the edges of the wounded or burned area—*always goes on first.*

Always tie the ends of the bandage together securely with the knot placed where it will not cause discomfort and where it may be reached easily. The reef or square knot is recommended (Figure 11, page 106).

Firmness without tightness is the thing to work for in bandaging. That is, the bandage must be tight enough to stay on and to keep the compress under it from slipping and sliding about, and yet not so tight as to cut off the blood supply of the injured part. The bandage must be dry, be-

cause wet cloth, especially cotton, shrinks as it dries and will automatically tighten the bandage. A bandage just tight enough may become too tight if the tissues start to swell, as they often do following an injury. For that reason, inspect the bandage frequently and loosen it if it seems to be cutting into the flesh.

In bandaging arms and legs, leave the fingers and toes exposed unless the nature of the injury makes it necessary to cover them, as they act as "barometers" to indicate the degree of pressure exerted by the bandage. If fingers or toes look bluish or swollen, the bandage is probably too tight.

It is impossible to become expert in the art of bandaging without special training and practice under supervision.

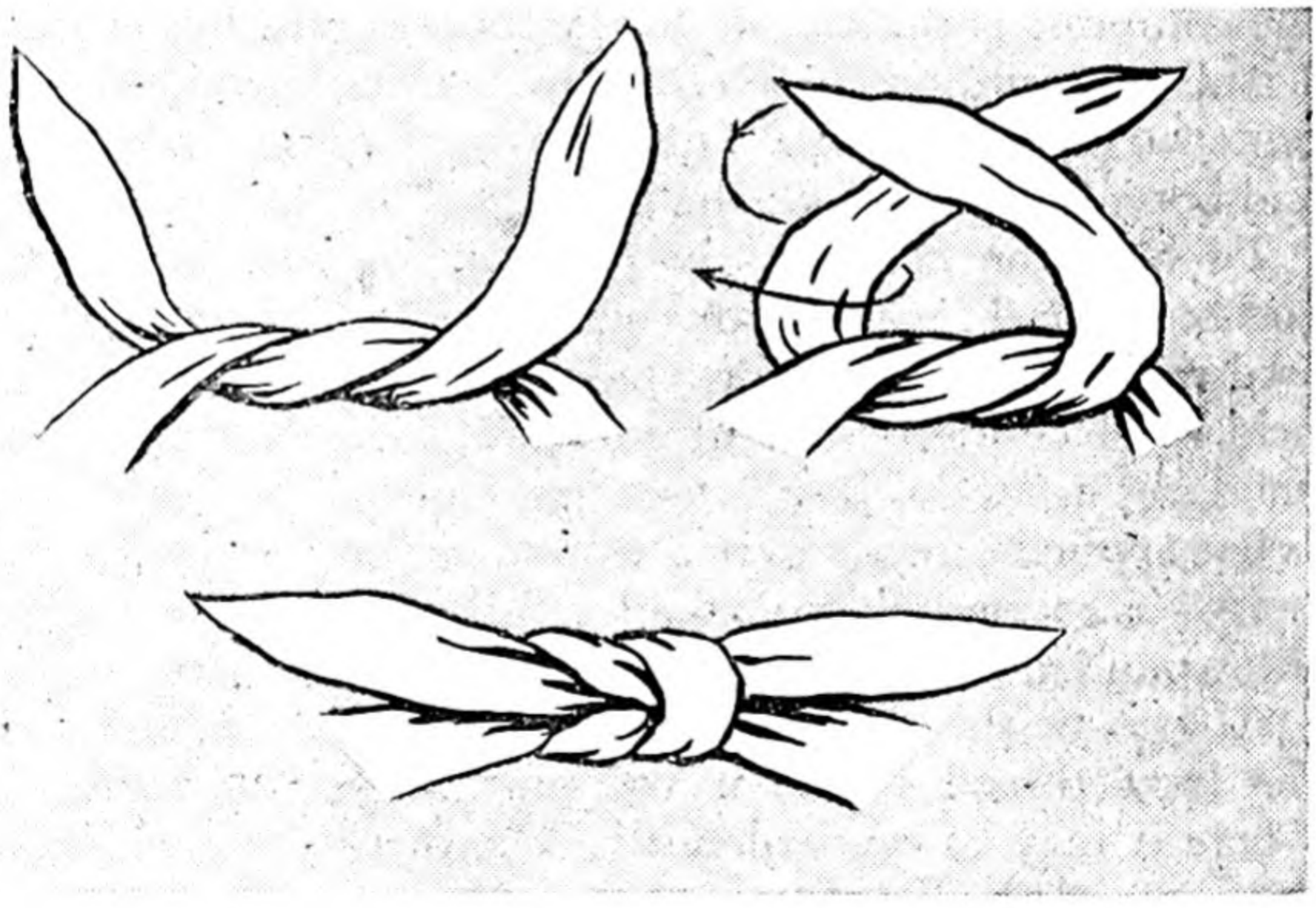


Figure 11. The Reef or Square Knot. Tie a single knot. Turn the ends toward each other across the knot. Take one end and pass it first over and then under the other end. Pull the two ends away from each other to complete the knot.

The diagrams and legends on pages 107-122 illustrate the methods commonly used in applying cravat and triangular bandages in first-aid work.

Bandages for the Extremities

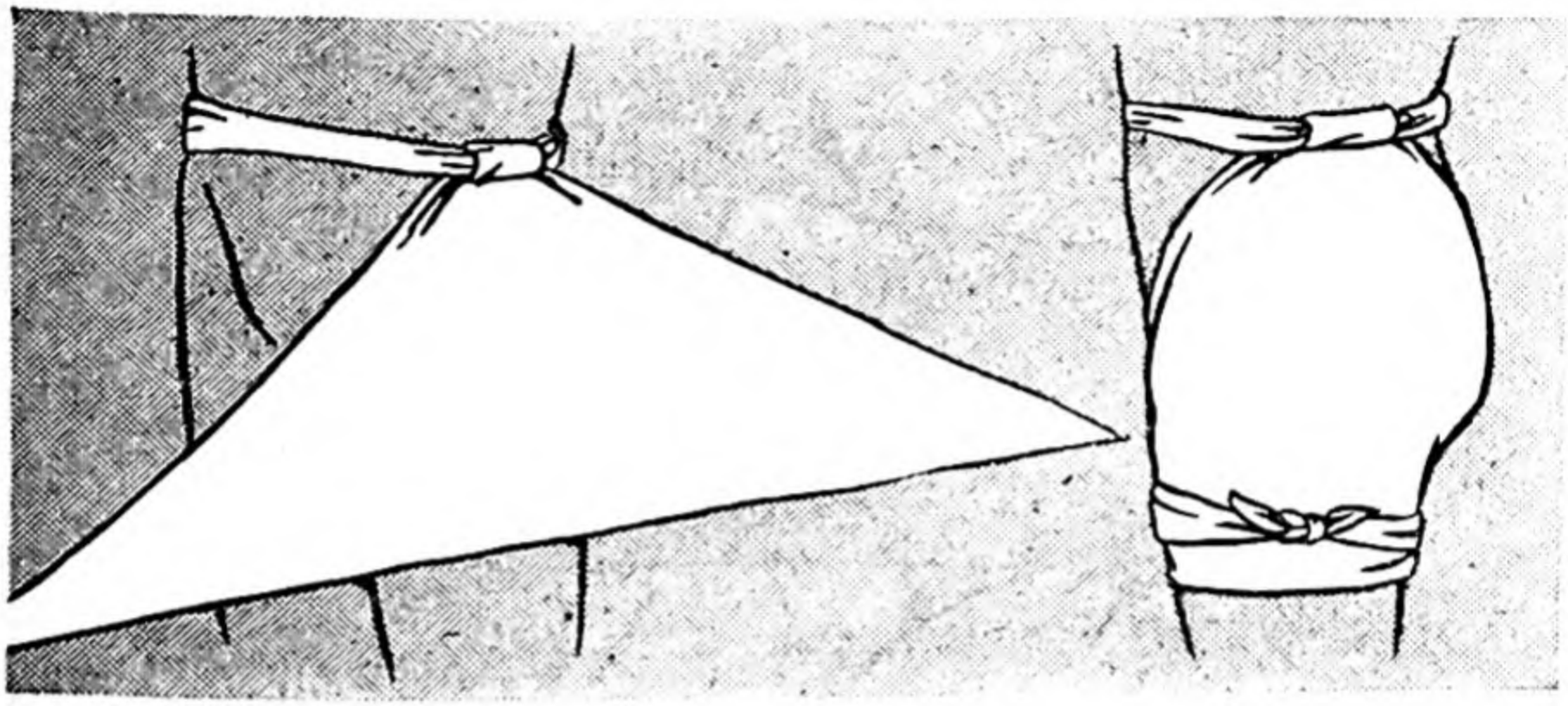


Figure 12. Bandage for a Wound or Burn of the Hip. First cover the injury with the pad of a sterile bandage compress and tie the pad in place with the bandage tails. Cover the dressing with a triangular bandage applied as follows: Pass a cravat bandage around the body and tie toward the front for a groin injury or toward the back for a hip injury. Tuck the apex of a triangular bandage up under the knot of the cravat bandage and tie it in the knot or pin it with a safety pin or tuck it under smoothly. Roll or fold up the base as far as desired. Bring the ends snugly around the thigh and tie on the outside.

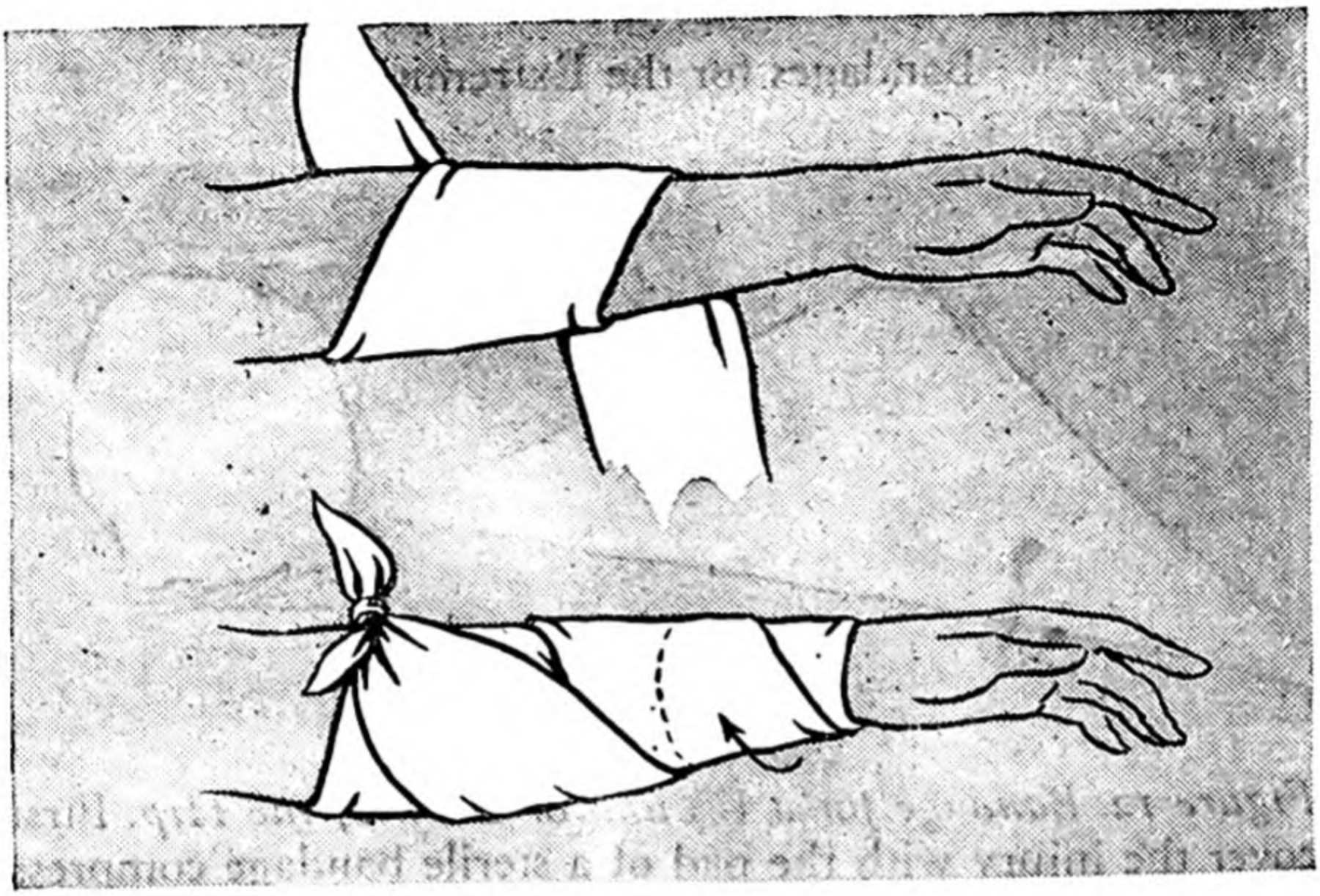


Figure 13. Bandage for a Wound or Burn of the Arm, Upper or Forearm; Leg, Thigh or Lower Leg. Cover the injury with the pad of a sterile bandage compress, wrap the tails several times around the limb and tie over the pad. Cover the dressing with a spiral bandage applied as in the following directions for applying a spiral cravat to the forearm. Hold one end of a cravat bandage on the forearm near the elbow. Keeping a firm grasp on that end, wrap the bandage in a spiral around the limb to the wrist. Reverse, and spiral back up the arm to the starting point. Tie the two ends together. Support a wounded arm in a triangular sling. Keep a wounded leg elevated.

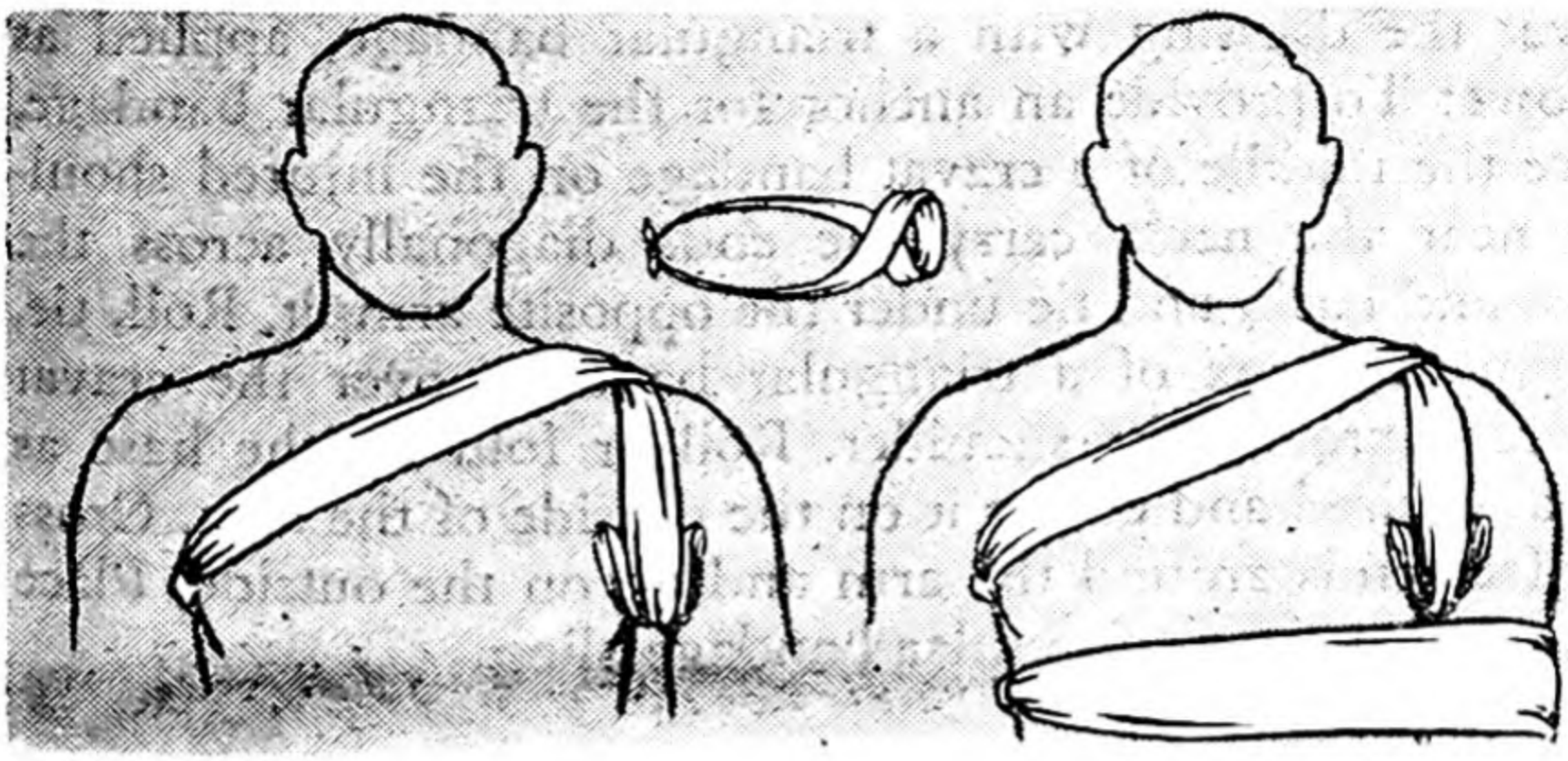


Figure 14. Wound and Bleeding of Armpit. Place the center of a cravat bandage over the compress covering the wound. Carry the ends of the bandage up and cross on the shoulder. Pass one end across the back and one end across the chest. Tie under the opposite armpit. Do not tie tightly enough to cut off the circulation in the axillary artery.

If bleeding is severe, push a firm pad well up into the armpit over the compress. Bring the arm down and fasten it to the side of the body by passing a cravat bandage around the arm and chest and tying securely on the opposite side.

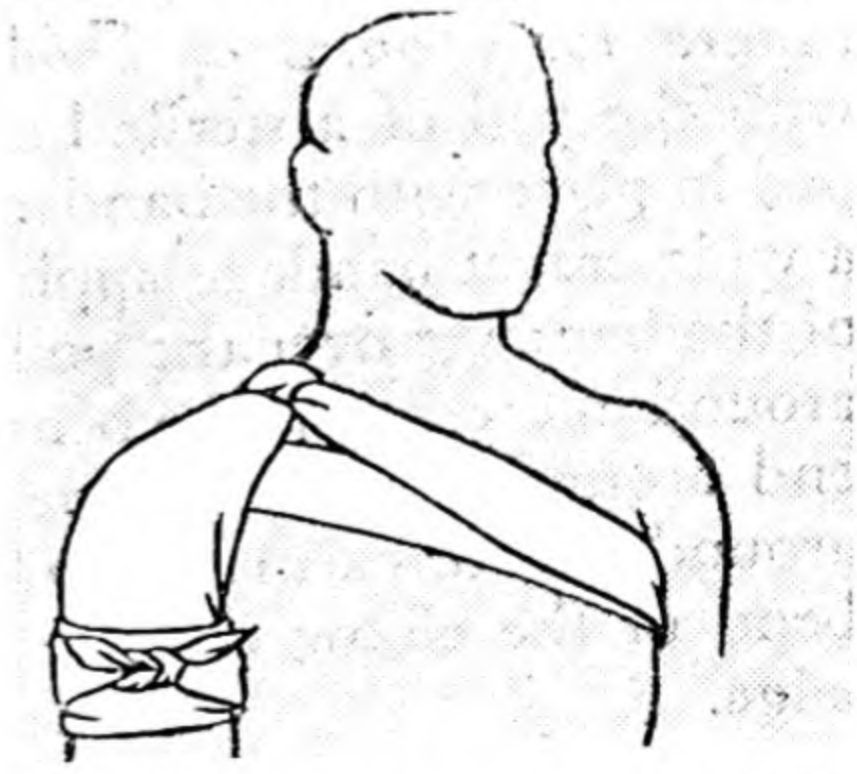


Figure 15. Bandage for a Wound or Burn of the Shoulder. Apply a sterile bandage compress with long tails as follows: Place the sterile pad of the bandage over the wound. Carry the ends under the armpit and cross. Carry the ends to the top of the compress and cross. Carry one end across the back, and the other across the chest, and tie under the opposite armpit.

Cover the dressing with a triangular bandage, applied as follows: To provide an anchor for the triangular bandage, place the middle of a cravat bandage on the injured shoulder near the neck, carry the ends diagonally across the chest and back, and tie under the opposite armpit. Roll, tie, or pin the apex of a triangular bandage over the cravat where it crosses the shoulder. Roll or fold up the base as far as desired and center it on the outside of the arm. Cross the free ends around the arm and tie on the outside. Place the forearm in a triangular bandage sling.

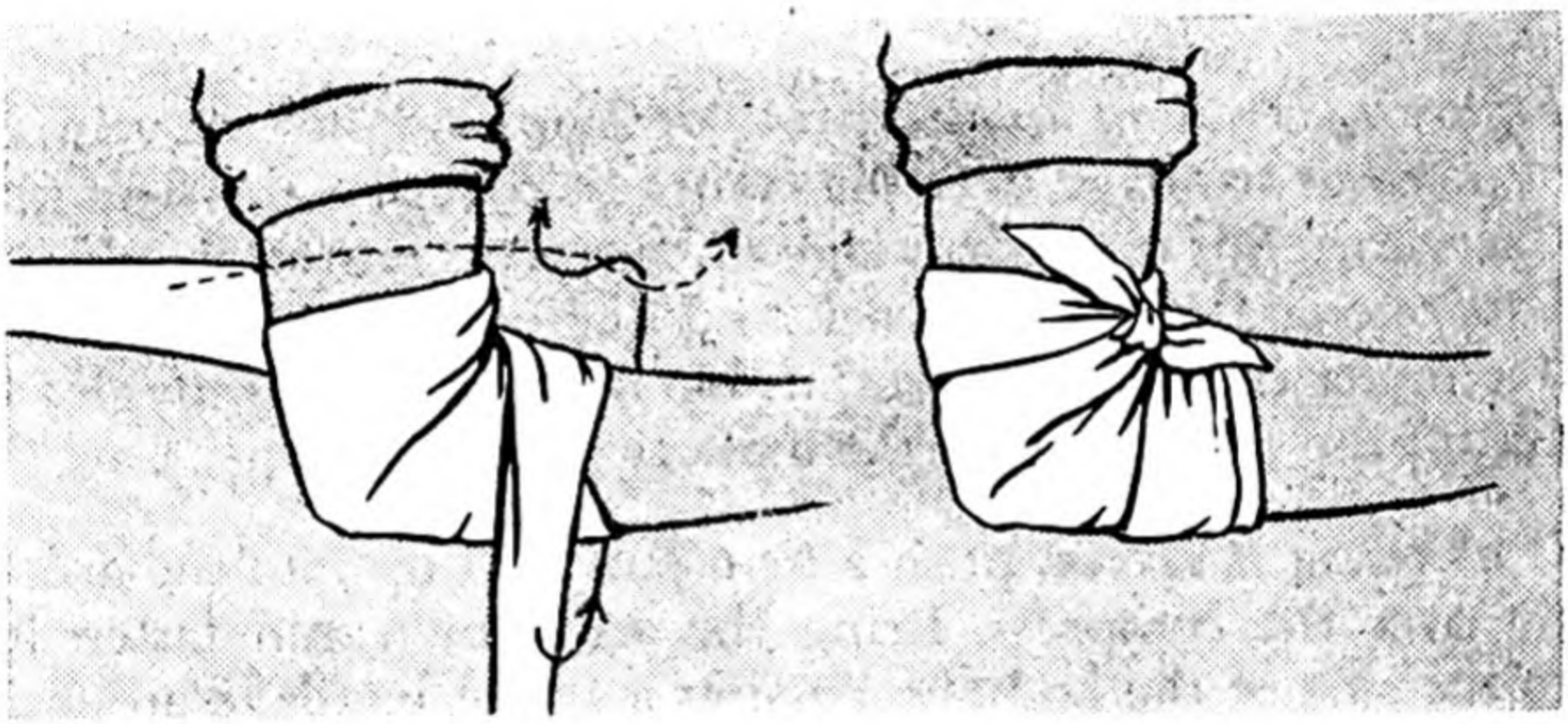


Figure 16. Wound of Elbow or Knee. Cover the injury with the pad of a sterile bandage compress and fasten the pad in place with the bandage tails. Cover the dressing with a wide cravat bandage applied as follows: Place the middle of the bandage over the point of the elbow. Bring the ends around and cross in the bend of the elbow. Carry the upper end around the arm above the elbow and the lower end around the forearm below the elbow. Cross again at the bend of the elbow and tie the ends together at the outer edge.

Apply a cravat bandage to the knee in the same way, but use a wider bandage.

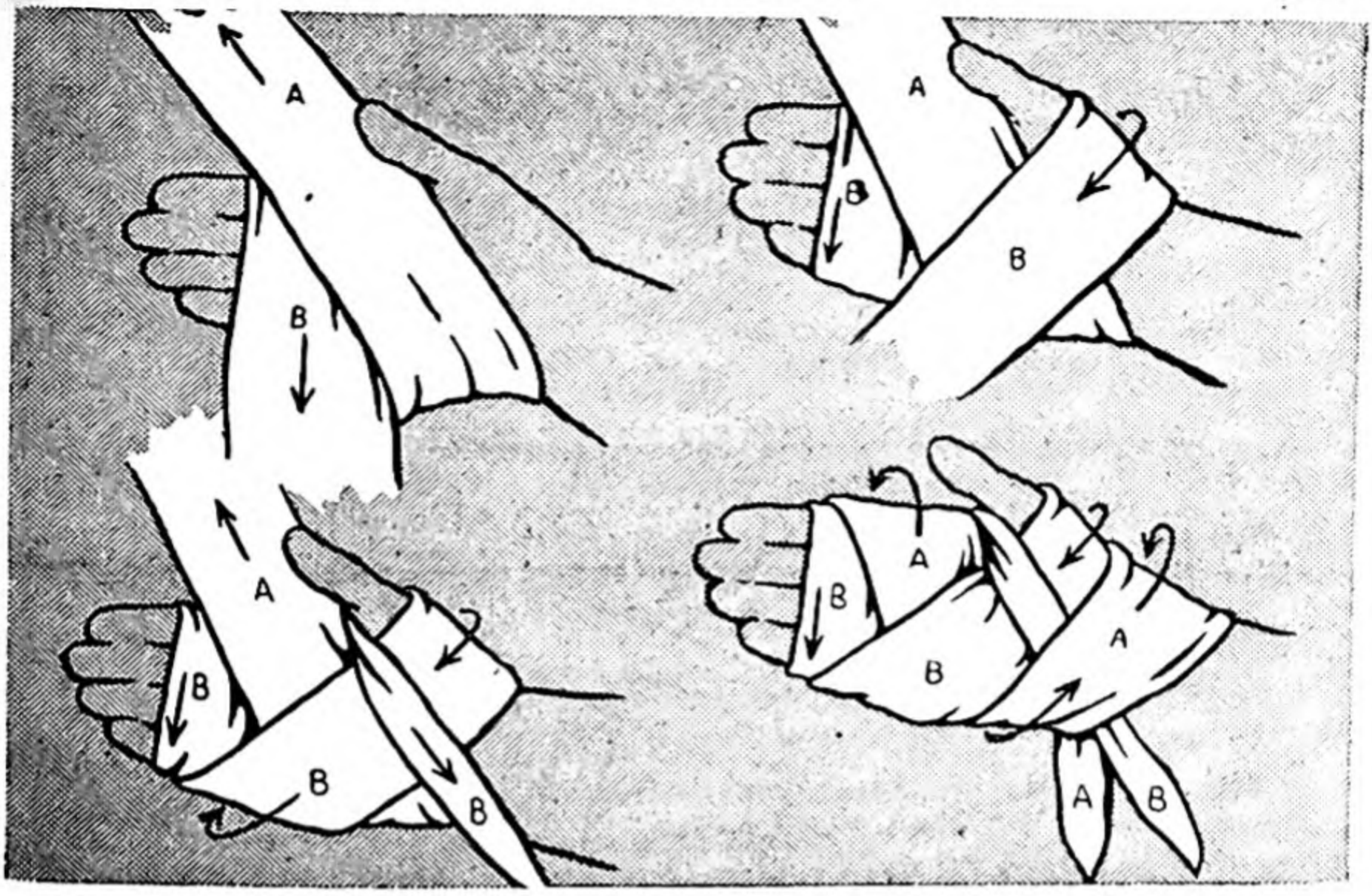


Figure 17. Bandage for a Wound or Burn of the Palm of the Hand. Cover the injury with the pad of a sterile bandage compress and fasten the pad in place by passing the tails several times around the hand and wrist and tying over the pad. Cover the dressing with a cravat bandage applied as follows: Place the center of the bandage over the pad. Carry the end on the thumb side (End *A*) diagonally across the back of the hand toward the wrist on the little finger side, on across the palm, and back between the thumb and forefinger. Hold it there. Next pass the end on the little finger side (End *B*) diagonally across the back of the hand, around the base of the thumb, on across the palm, and around the back of the hand to the thumb side. Bring *B* between the thumb and index finger and continue diagonally across the palm to the wrist. Now bring *A* across the back of the hand, wrap it around the wrist, and tie the ends (*A* and *B*) together.

Use this bandage also to cover the dressing on an injury of the back of the hand.

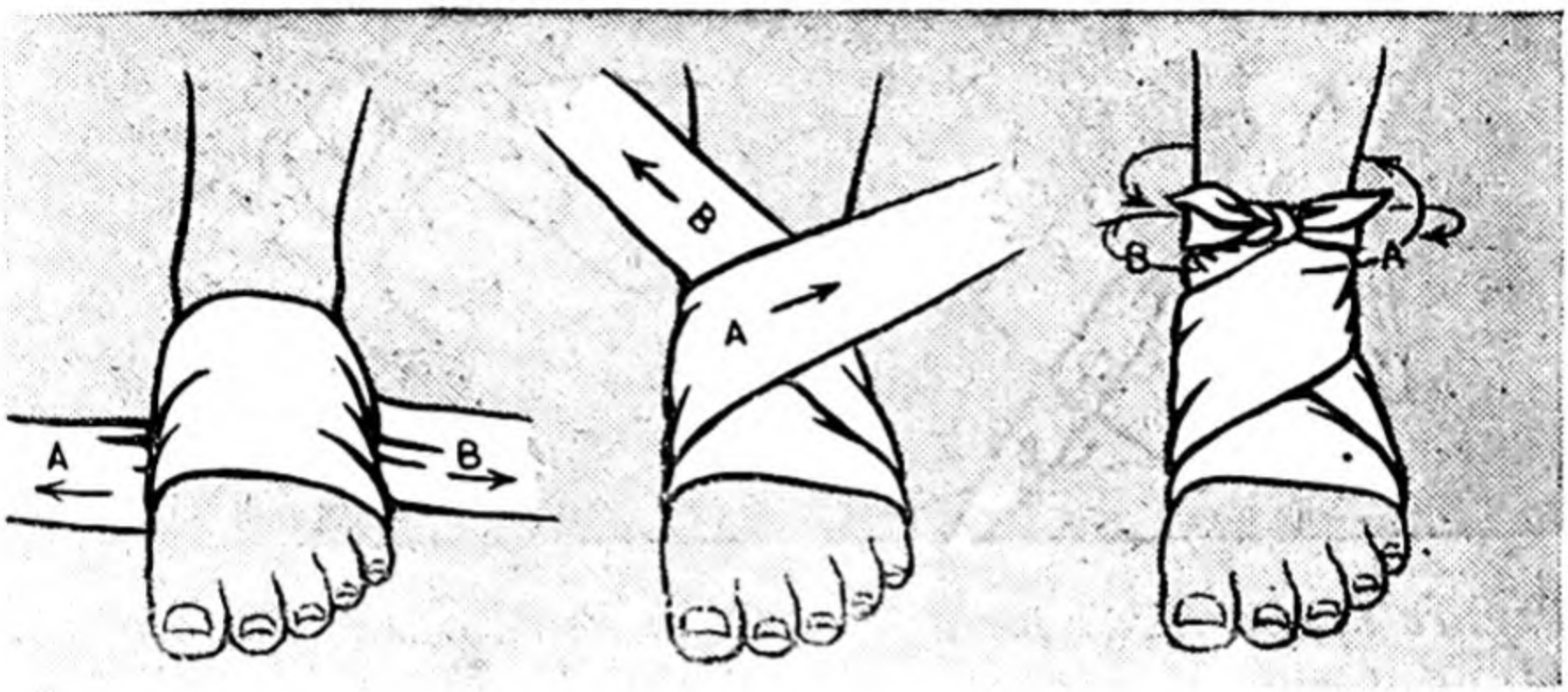
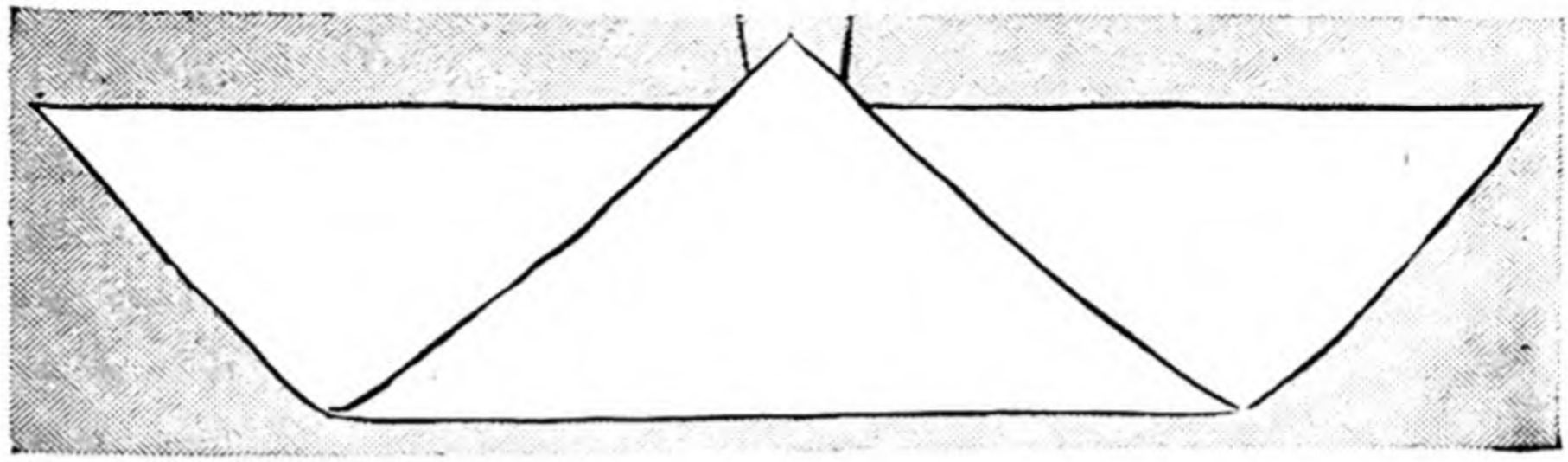


Figure 18. Bandage for Wound or Burn of the Foot. Hold a compress in position over the wound with a wide cravat bandage applied as follows. Place the middle of the bandage over the compress, cross the ends under the sole of the foot, bring them up and cross over the instep. Pass them around the back of the ankle, cross, bring to the front and tie.



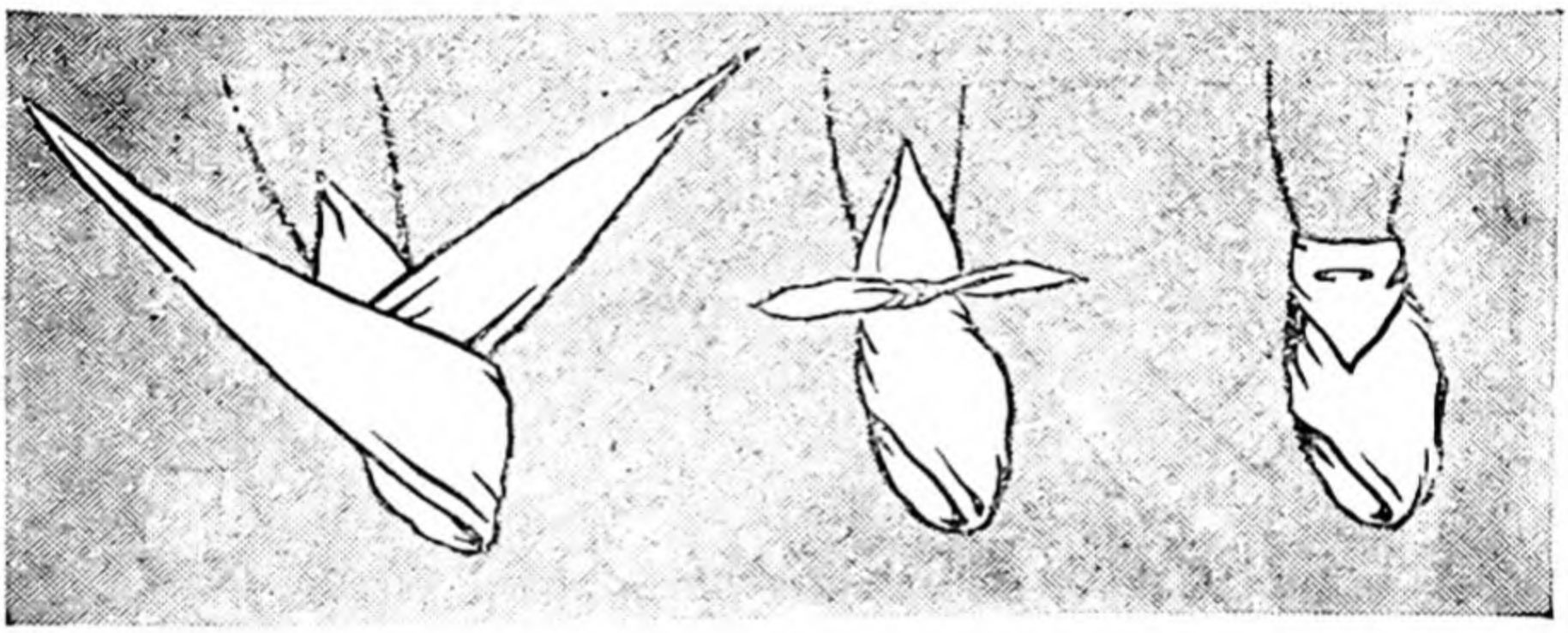


Figure 19. Bandage for a Hand, Crushed, Mangled, or Extensively Burned. Cover the injury with several thicknesses of sterile gauze. Hold the gauze in place with a bandage applied as follows: Place the base of an open triangular bandage well up on the inner side of the wrist with the apex extending down over the palm of the hand for some distance beyond the tips of the fingers. Carry the apex up over the fingers and back of the hand to the outer side of the wrist. Cross the two halves of the bandage loosely over the back of the wrist. Wrap the ends two or three times around the wrist and tie. Bring the apex down over the knot and pin or tuck it under.

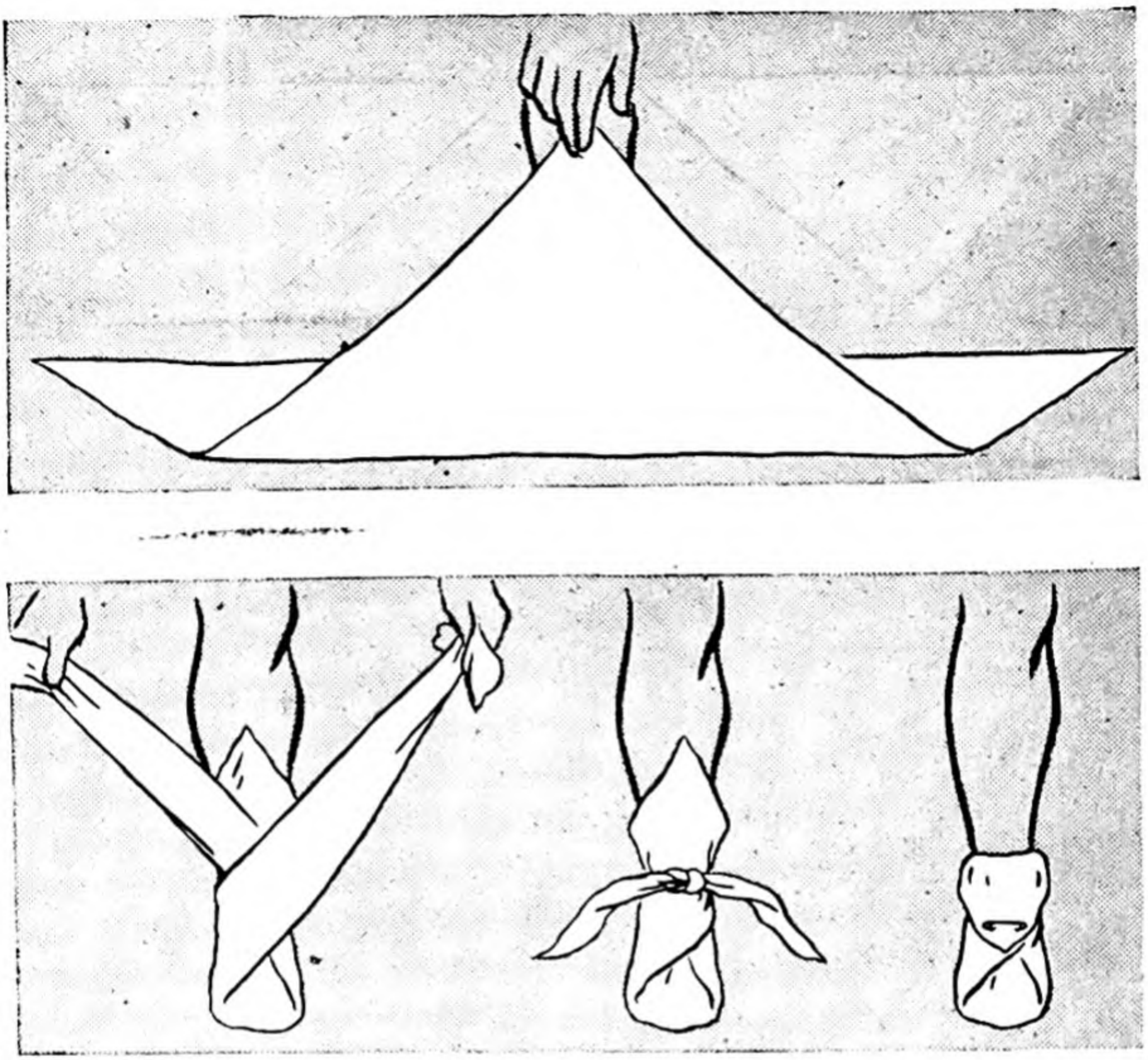


Figure 20. Bandage for a Foot, Crushed, Mangled, or Extensively Burned. Swathe the whole foot in sterile gauze. Cover the dressing with a bandage applied as follows: Place the foot on the triangle so that the base is several inches back of the heel and the apex reaches several inches beyond the toes. Draw the base up over the heel to the ankle in back and carry the apex up over the toes and instep to the ankle in front. Cross the two halves of the bandage loosely over the instep, wrap the ends around the ankle two or three times, and tie above the heel. Bring the apex down over the knot and pin or tuck it under.

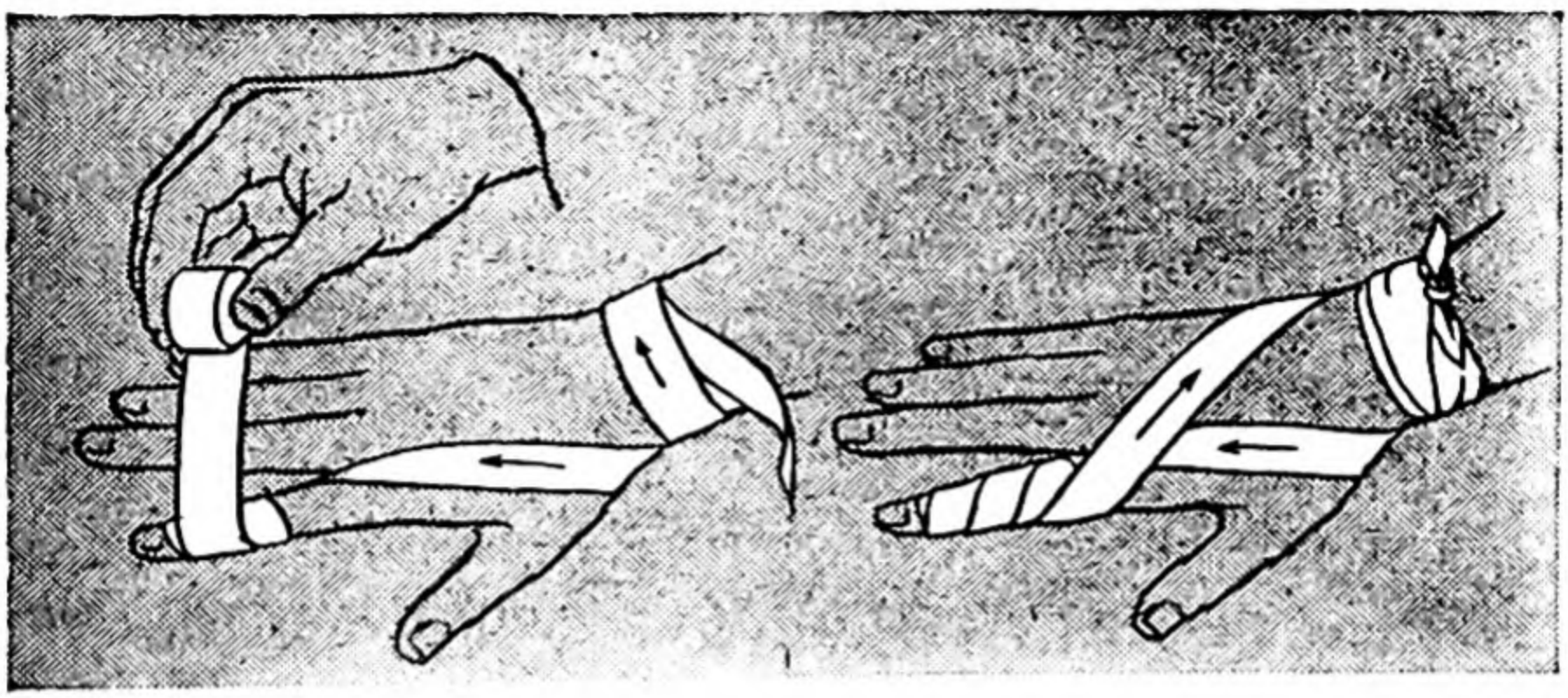


Figure 21. Bandaging Fingers (or Toes). For a small wound or cut, a small compress on adhesive is most satisfactory. Place the sterile pad over the wound and press the ends of the adhesive smoothly around the finger so that the pad is held snugly in place

For an extensive wound of the finger (or toe), use one-inch roller gauze to hold a compress in place as follows: Wrap the free end of the bandage two or three times around the wrist. Unroll the bandage across the back of the hand to the base of the injured finger and then spiral up the finger and down again. Continue unrolling the bandage across the back of the hand to the wrist, wrap once or twice around the wrist, cut, and tie the two ends together. If two or more fingers are injured, bandage each one separately and, if necessary, cover the whole hand with an open triangular bandage (Figure 19).

Bandage injured toes in the same way.

Bandages for the Head and Neck

Figure 22. Bandage for Wound of Scalp, Temple, Cheek, or Ear. Cover the wound with a sterile gauze compress and place the middle of a wide cravat bandage over the compress. Carry one end under the chin and the other end over the top of the head. Cross the ends on the opposite side. Bring back one end around the front and the other end around the back of the head and tie over the compress.

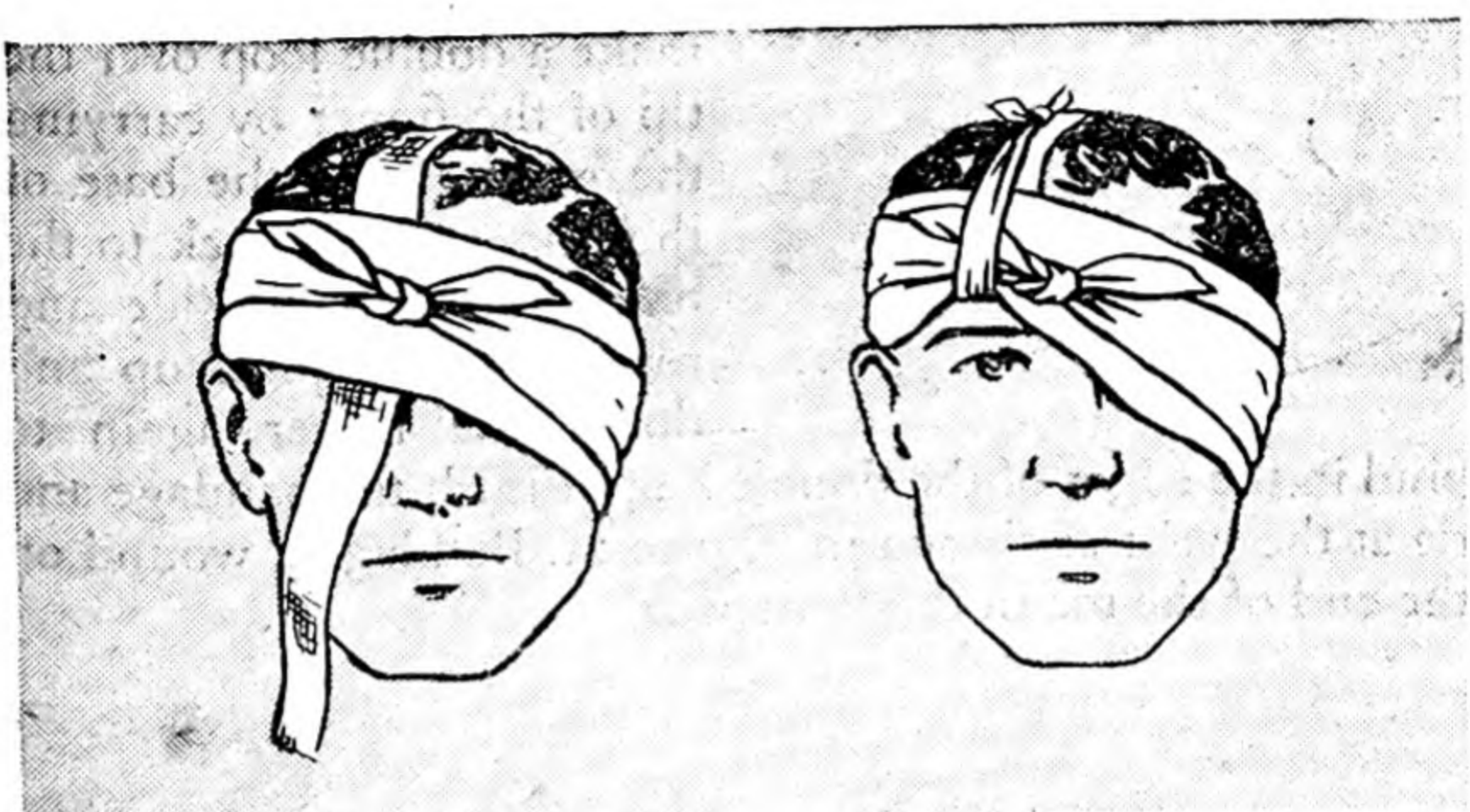


Figure 23. Bandage for Wound of Eye. Lay a strip of roller bandage over the top of the head so that one end dangles over the uninjured eye and the other end over the back of the head. Place the center of a cravat bandage over the compress covering the injured eye. Carry the end on the injured side over the ear to the back of the head, the other end above the ear to the back of the head. Cross the ends below the "bump," and bring them back to the forehead and tie above the nose. Now bring the strip of roller bandage to the top of the head and tie in order to anchor the bandage above the uninjured eye.

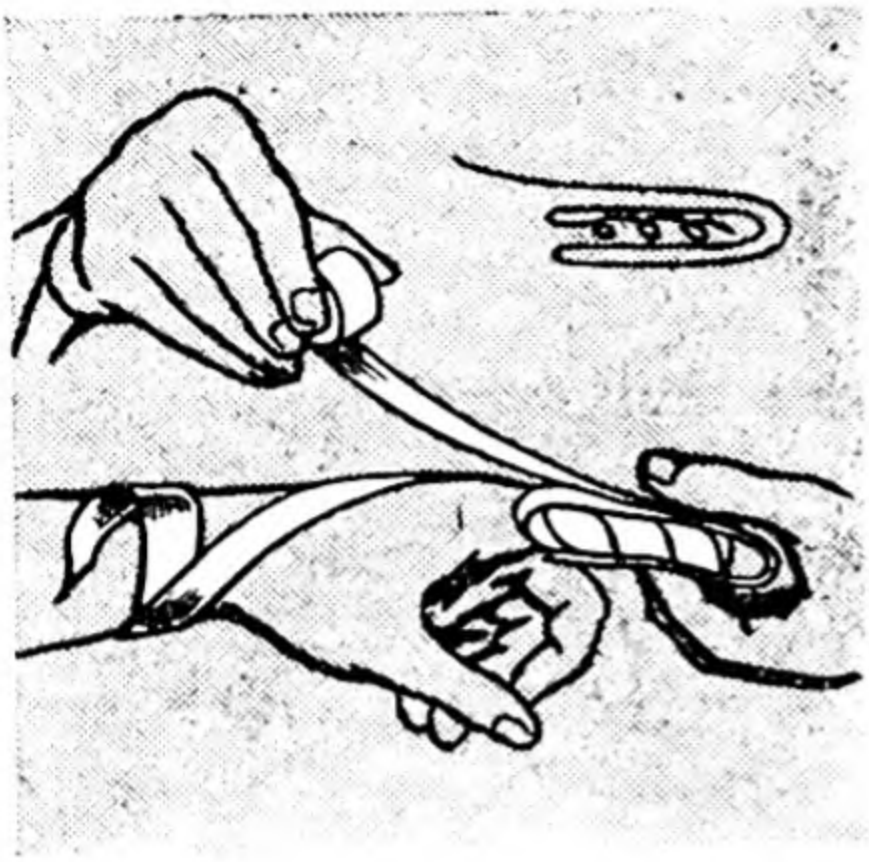


Figure 24. Bandage for End of Finger (or Toe). Spiral up and down the finger as shown in Figure 21. Then make a double loop over the tip of the finger by carrying the gauze from the base of the finger at the back to the base on the palm side and return. Then spiral up and down the finger again to bind in the edges of the double loop. Finish the bandage and tie at the wrist as shown in Figure 21. Bandage a wound on the end of the toe in the same way.

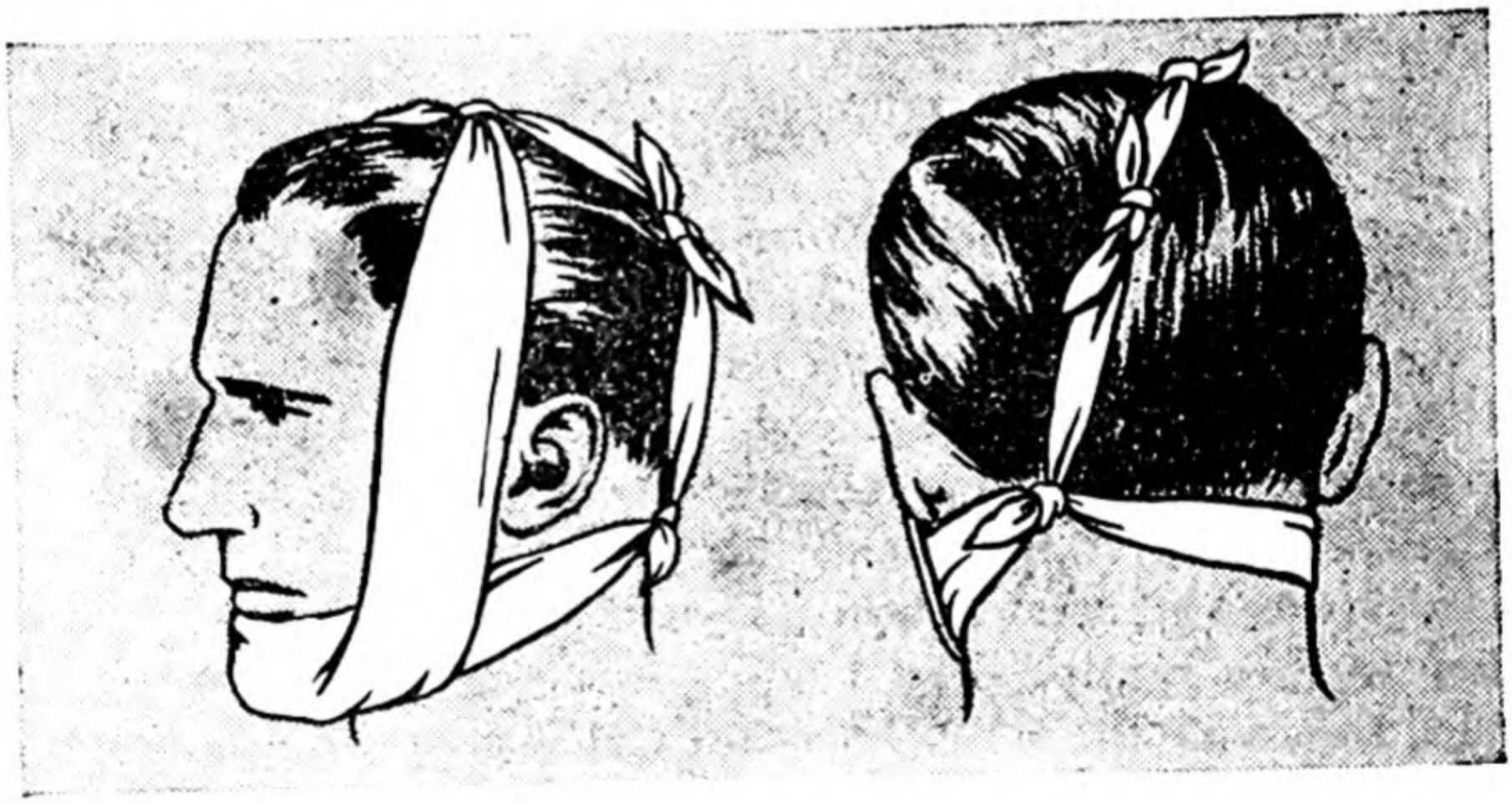


Figure 25. Bandage for Wound of Chin. Split the tails of a sterile bandage compress to make a four-tailed bandage. Place the pad of the compress over the wound and cross the tails. Carry one pair of tails below the ears to the back of the neck and the other pair in front of the ears to the top of the head. Tie the ends of each pair off center and anchor the bandage by tying together the long ends of each knot.

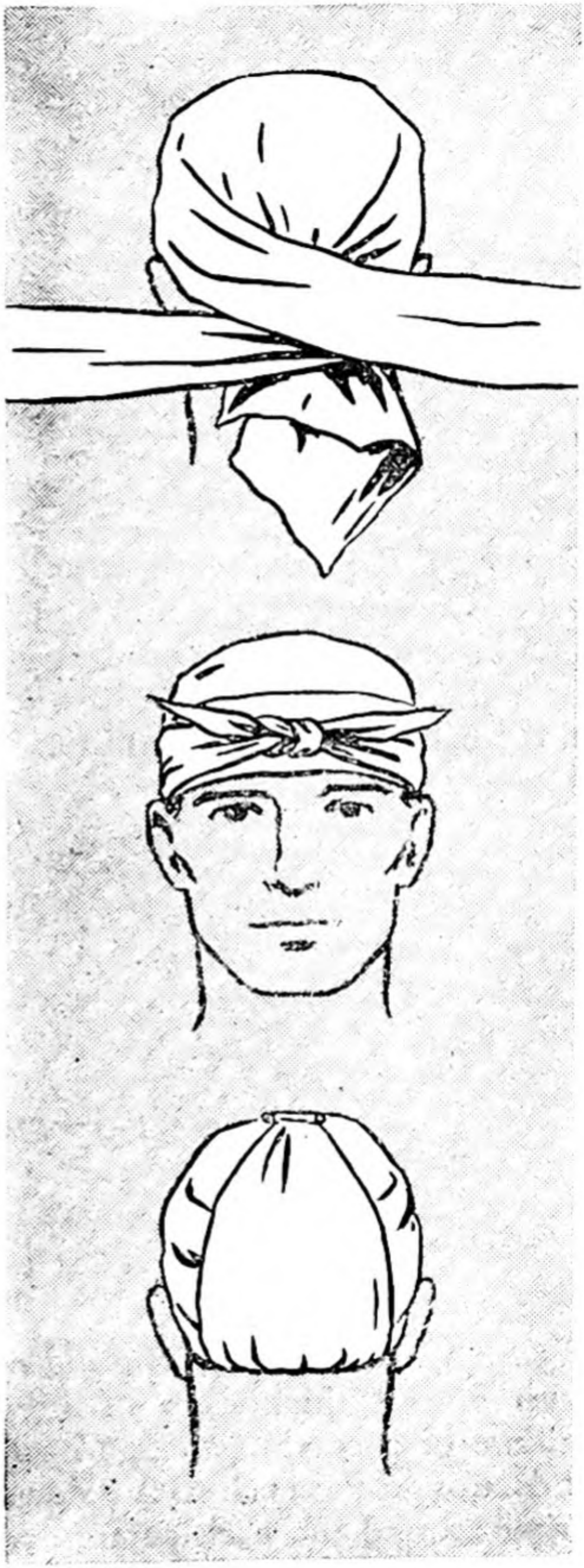


Figure 26. Bandage for a Large Wound or Wounds of the Forehead or Scalp. Completely cover the wounded area with several thicknesses of sterile gauze. Hold the dressing in place as follows: Place the base of a triangular bandage across the forehead just above the eyebrows and let the apex hang down at the back of the neck. Bring the ends of the base around the head just above the ears and cross just below the "bump." Pull the ends tight, return them to the middle of the forehead, and tie just above the nose. Pull down the point in back to make the bandage fit snugly. Then tuck it in or fasten it with a safety pin.

Figure 27. Bandage for Wound of Nose. Split the tails of a large sterile bandage compress to make a four-tailed bandage. Place the pad of the compress over the wound, cross the tails, pass them above and below the ears on each side to the back of the head, and tie.

Figure 28. Bandage for Wound of Neck. Cover the wound with several thicknesses of sterile gauze, and place the middle of a cravat bandage over the compress. Carry the ends around the neck to the side opposite the wound, cross, bring around the neck again, and tie loosely.

Bandages for the Trunk

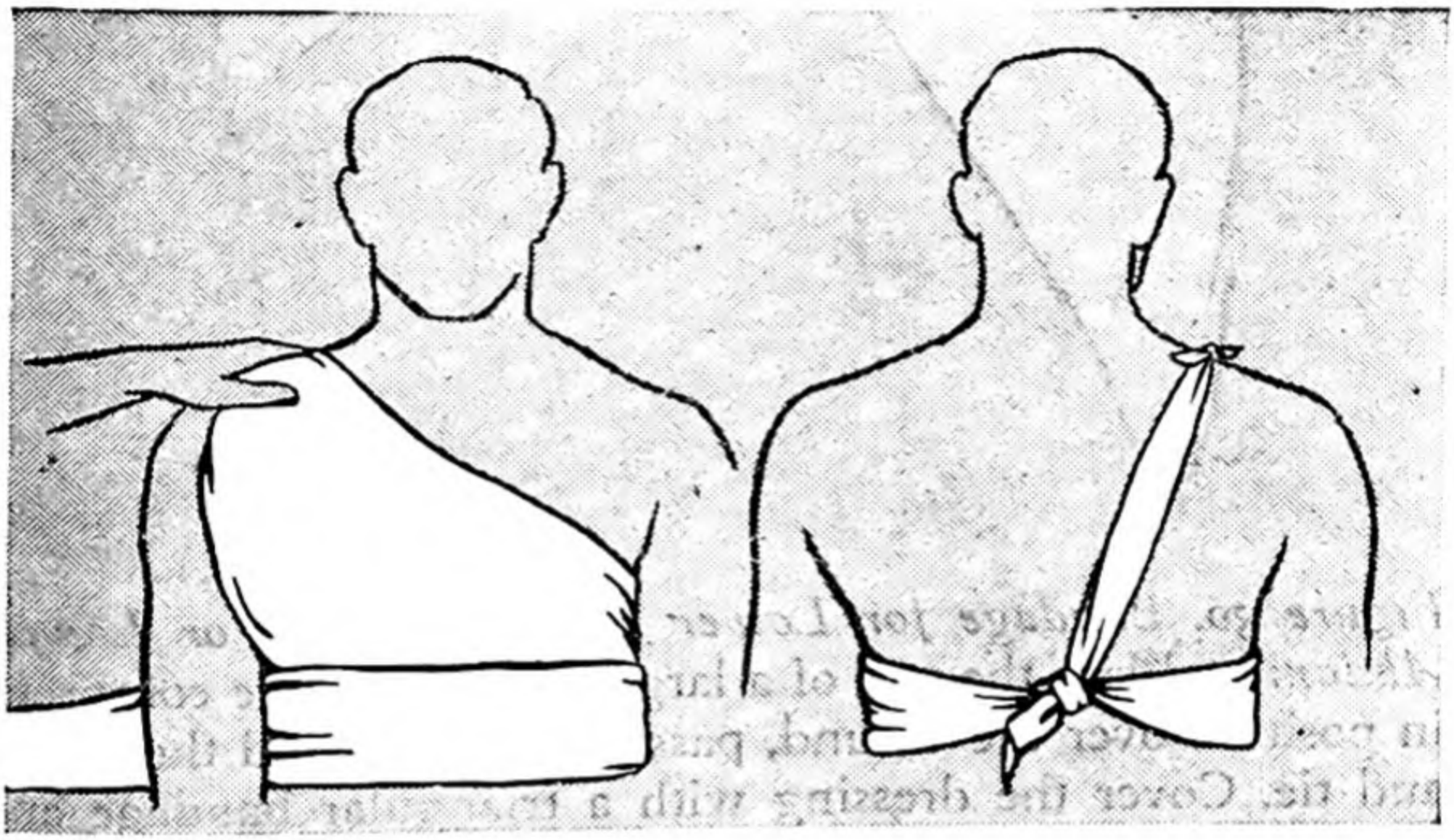


Figure 29. Bandage for Wound or Burn of the Chest or Upper Back. Place the pad of a large sterile bandage compress over the injury and carry the tails around the body and tie to hold the pad firmly in position. Cover the dressing with an open triangular bandage as follows: Hold the apex of the triangle over the shoulder on the injured side. Bring the bandage down over the chest (or back) and roll or fold up the base as far as you want it to go. Carry the ends of the base around the body and tie in back (or front) below the shoulder on the injured side. Carry the long end of the knot up to the shoulder and tie to the apex of the triangle being held there by the injured person or an assistant.

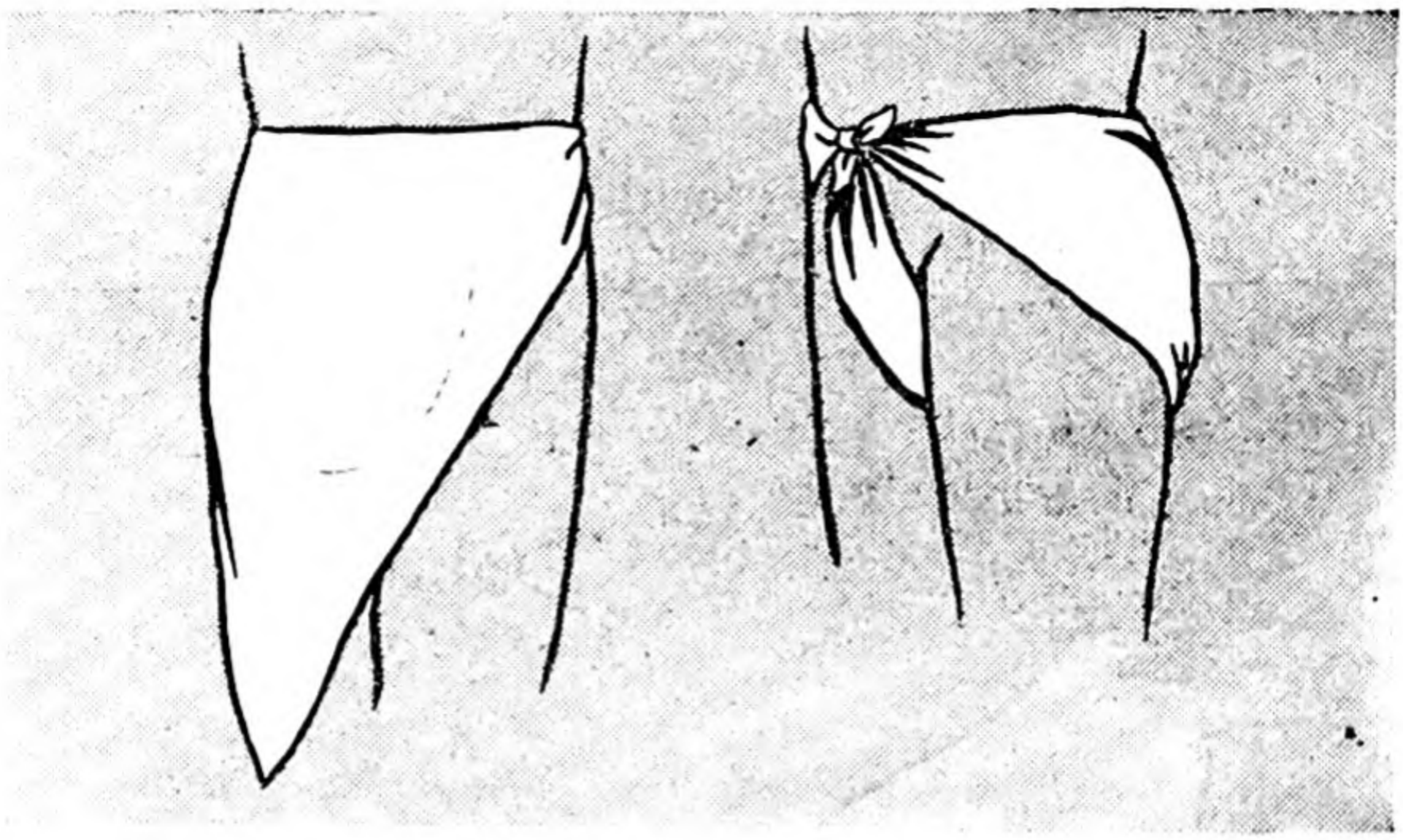


Figure 30. Bandage for Lower Back, Buttocks, or Lower Abdomen. Place the pad of a large sterile bandage compress in position over the wound, pass the tails around the body, and tie. Cover the dressing with a triangular bandage applied as follows: Tie the base of a large open triangular bandage around the middle of the body with the ends in front for a wound of the lower back or buttocks; in back for a wound of the lower abdomen. Pull the apex forward through the crotch and fasten to the tied ends of the base. If one triangular bandage is not large enough, tie the apexes of two triangular bandages together and place the apexes in the crotch. Bring the base of one up on the abdomen and tie the ends together at the back. Bring the base of the other up on the back and tie the ends together in front.

BARBITAL POISONING. *See* Poison Table, Barbiturates, page 253.

BAYONET WOUNDS. *See under* Punctured Wounds, page 319; Trunk Wounds, page 320.

BEE STINGS. *See under* Bites, Insect.

BELLADONNA POISONING. *See* Poison Table, Atropine, page 253.

BENZINE, INHALED. *See* Gasoline, Benzine, and Naphtha Fumes Inhaled, page 222.

SWALLOWED. *See* Poison Table, Petroleum Distillates, page 262.

BICHLORIDE OF MERCURY POISONING. *See* Poison Table, page 259.

BITES, ANIMAL

The bite of a warm-blooded animal, such as a dog or cat, is a wound which might be treated as any other wound were it not for the danger of rabies or hydrophobia.

Rabies—a disease fatal both to susceptible animals and to man—is caused by a disease agent called a virus, which attacks the central nervous system. The virus is present in the saliva of a rabid, or mad, animal. If the animal bites a person or another animal, the virus-loaded saliva enters the wound. The virus also may enter any cut or scratch if the animal's saliva comes in contact with it, as in licking. The virus gets to the brain and spinal cord from the wound by traveling along the nerves.

The average length of time it takes for the virus to get to the brain and produce rabies is from fifty to sixty days. However, it may take much shorter or longer than this, depending on the location of the bite and its severity. The closer the wound is to the brain, the more quickly the virus will reach the brain. Thus rabies develops earlier after bites on the head and face than after bites on the arm or leg. Rabies does not develop in everyone bitten by a mad animal, but no one who has once shown the symptoms has ever recovered. It is one hundred per cent fatal.

Fortunately, the development of rabies after a mad-animal bite may be prevented by the Pasteur antirabic treatment. Therefore, it is of the utmost importance to determine whether the biting animal was rabid in every case of animal bite. As rabies is spread mainly by the bite of a mad dog,

that animal is referred to in the following section, but the same procedure is to be followed in all cases of animal bite when rabies in the biting animal is present or suspected.

DOG BITE

What to Do for the Person Bitten. Wash the wound immediately under running water, to flush out the animal's saliva. Apply tincture of iodine, let it dry, and cover with a sterile compress held in place by adhesive tape or a bandage. This procedure will not prevent rabies. It will only help to prevent other infection. *Then go at once to a physician.* The physician will treat the wound and will make the investigation necessary to determine whether the Pasteur antirabic treatment should be started immediately or whether it is safe to wait for a report on the dog. If the bite is on the face or neck, the Pasteur antirabic treatment should be started at once.

What to Do with the Dog. Do not kill the dog unless that is necessary in order to keep others from being bitten or unless its capture cannot be effected with safety. If a dog escapes after biting someone, no effort should be spared in capturing it. After capture turn the dog over to the health department to be watched, or shut him up securely and watch him yourself for fourteen days. If it remains well for that length of time it does not have rabies, and there is no danger from the wound except the usual danger of infection common to all wounds.

If the dog is killed or dies under observation, pack its head in a pail of ice and send it to the nearest health-department laboratory for examination. If it is discovered that the dog was mad, the Pasteur antirabic treatment must be started at once.

BITES, INSECT

The bites or stings of most insects are not dangerous in

themsclves as a rule, but often cause swelling and inflammation.

BEE, HORNET, WASP, AND YELLOW-JACKET STINGS

To relieve the discomfort, cover the bite with a paste of sodium bicarbonate (baking soda) and water or apply a compress wet with weak ammonia water. Some individuals who are especially sensitive to bee venom may go into a state of shock after a single sting. Treat for shock (see Shock, pages 95-98) and call a doctor.

When someone "runs into a hornets' nest" or gets "mixed up with" a swarm of angry bees or wasps, thereby receiving a massive "dose" of stings, put him into a tepid or warm bath lavishly laced with baking soda. It may be necesesary to treat for shock.

BLACK-WIDOW-SPIDER BITE. *See* Spider Bite, Black-Widow, page 126.

MOSQUITO BITE

To relieve the itching, apply a paste of sodium bicarbonate (baking soda) and water, or a cloth wet with ammonia water. Try not to scratch mosquito bites or any "itching" bites, as this may cause infection.

In regions where malaria is prevalent, the bite of an *Anopheles* mosquito may inoculate the person bitten with the malarial parasites. The most obvious sign of malaria is a severe chill followed by a high fever (chills and fever), which is repeated with clocklike precision every second, third, or fourth day, according to the type of malarial parasite involved. The specific remedy for malaria is quinine. The treatment should be carried out under the supervision of a physician, if possible. If you are going on a camping or exploring expedition into malarial country where it would be difficult to get a physician, take with you quinine or one of the synthetic substitute preparations and print on

the label of the box or bottle the directions for taking prescribed by your physician.

SPIDER BITES, BLACK-WIDOW

The Spider and Its Bite. It is believed that the black-widow spider is the only spider in this country that can cause serious trouble by its bite. The black widow is found in all parts of the United States but is most common in the Southern States. It is a coal-black, shiny spider with a small head and a smooth abdomen about the size of a large pea. The abdomen of the female is marked on the under side with a bright red or brick-red "hourglass." Although the bite of the male spider may produce pain and irritation, it is only the bite of the female that is dangerous.

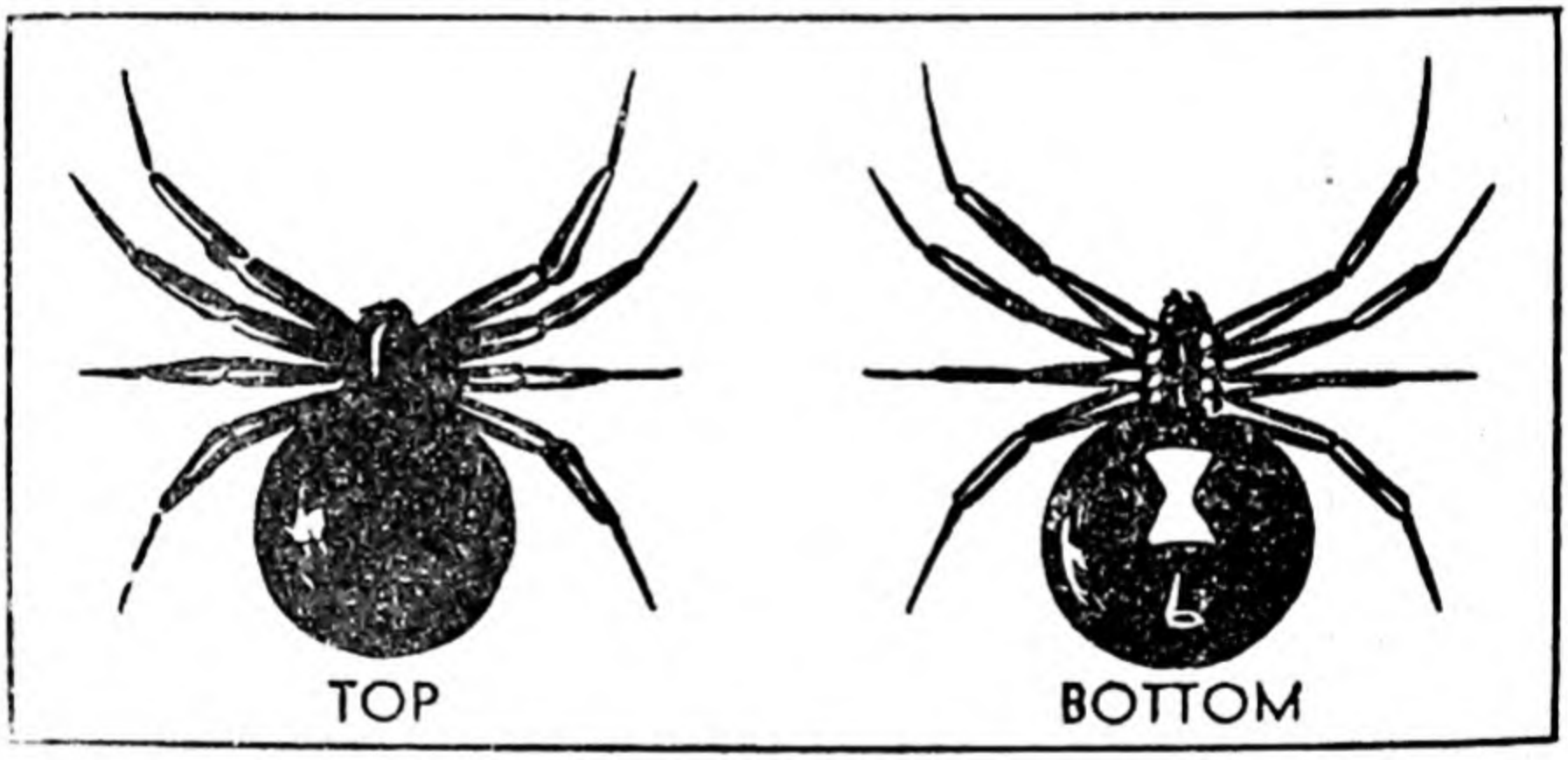


Figure 31. Female Black-Widow Spider (enlarged)

Signs and Symptoms. The sensation of a black-widow-spider bite is like that of a bee or wasp sting or a pinprick. Immediately after being bitten, a small red spot or a swelling may appear with a puncture wound the size of a pinhead in the center. Sometimes the victim does not know he has been bitten until the general symptoms appear from ten minutes to several hours later.

Intense pain in the region of the bite is the first symptom noted, followed shortly afterward by rigidity or spasm of the muscles, a weak, slow pulse, coldness of the extremities, and, in some cases, profuse cold perspiration. Death seldom occurs, except in young children or in old, infirm people.

What to Do. When it is known or suspected that someone has been bitten by a black-widow spider, lose no time in getting a doctor. If possible, save the body of the spider for identification. Wash out the wound with strong soapsuds and then apply a compress saturated with ammonia water or a strong solution of sodium bicarbonate (baking soda). Keep the victim warm and quiet and treat for shock if necessary. Give black coffee as a stimulant. A hot tub bath may give relief from the agonizing muscular pain and abdominal cramps.

TICK BITE

The tick is a blood-sucking insect prevalent in the spring and summer months. It is responsible for spreading several communicable diseases, among them the extremely serious infection called Rocky Mountain spotted fever. In biting, the tick sinks its probe into the flesh and hangs on.

Removal of the Tick. Since early removal of the tick reduces the chances of infection with Rocky Mountain spotted fever, it is important to find and to remove any ticks which may have attached themselves to your person. After walking or working in woods where ticks are prevalent, undress and look yourself over from head to foot. The trick in removing any ticks discovered is to make sure that the probe does not break off and remain embedded in the tissues.

The insect may be induced to withdraw its head by holding a lighted cigarette or the hot tip of an implement, such as a knife or needle, near its rear end. Then pick up the tick with forceps, tweezers, or a bit of cotton held between the

fingers, and destroy it. Do not crush the tick between your bare fingers. After removal of the tick, paint the wound with iodine.

BITES, SNAKE

Hallmarks of Poisonous Snakes. There are four kinds of poisonous snakes in the United States: the coral snake found only in the South, the Southern cottonmouth moccasin and its Northern relative, the copperhead, and the ubiquitous rattlesnake. The coral snake is identified by broad, alternating rings of red and black divided by very narrow rings of yellow. Copperheads, moccasins, and rattlers have flat triangular heads, thin necks, and thick bodies. A blind pit between the eye and the nostril on each side of the head gives these snakes the general name of pit vipers. The distinguishing mark of the rattler is its rattle; of the copperhead, reddish-brown markings like dumbbells across its dull-hazel-brown back; and of the moccasin, wide black crossbands across its dull-olive body.

The Bite. Poisonous snakes have two long grooved fangs, connected with a poison sac. When the snake "strikes," it uses its fangs as hypodermic needles—first to puncture the flesh of the victim and then to squirt venom into the wound through the grooves. The marks of the bite are the two tiny fang punctures.

In seventy-five per cent of the cases of snake bite, the bite is on the leg or ankle, and in about twenty-two per cent, on the arm or hand. Thus when walking in snake-infested country, the legs should be protected with high-topped shoes or heavy leggings, and the hand should not be placed on or close to the ground without looking first.

Signs and Symptoms. The bite of a poisonous snake is rapidly followed by stinging pain and, within a very short time, by swelling. The victim soon develops signs and symptoms of poisoning—rapid, weak pulse, pallor, great weak-

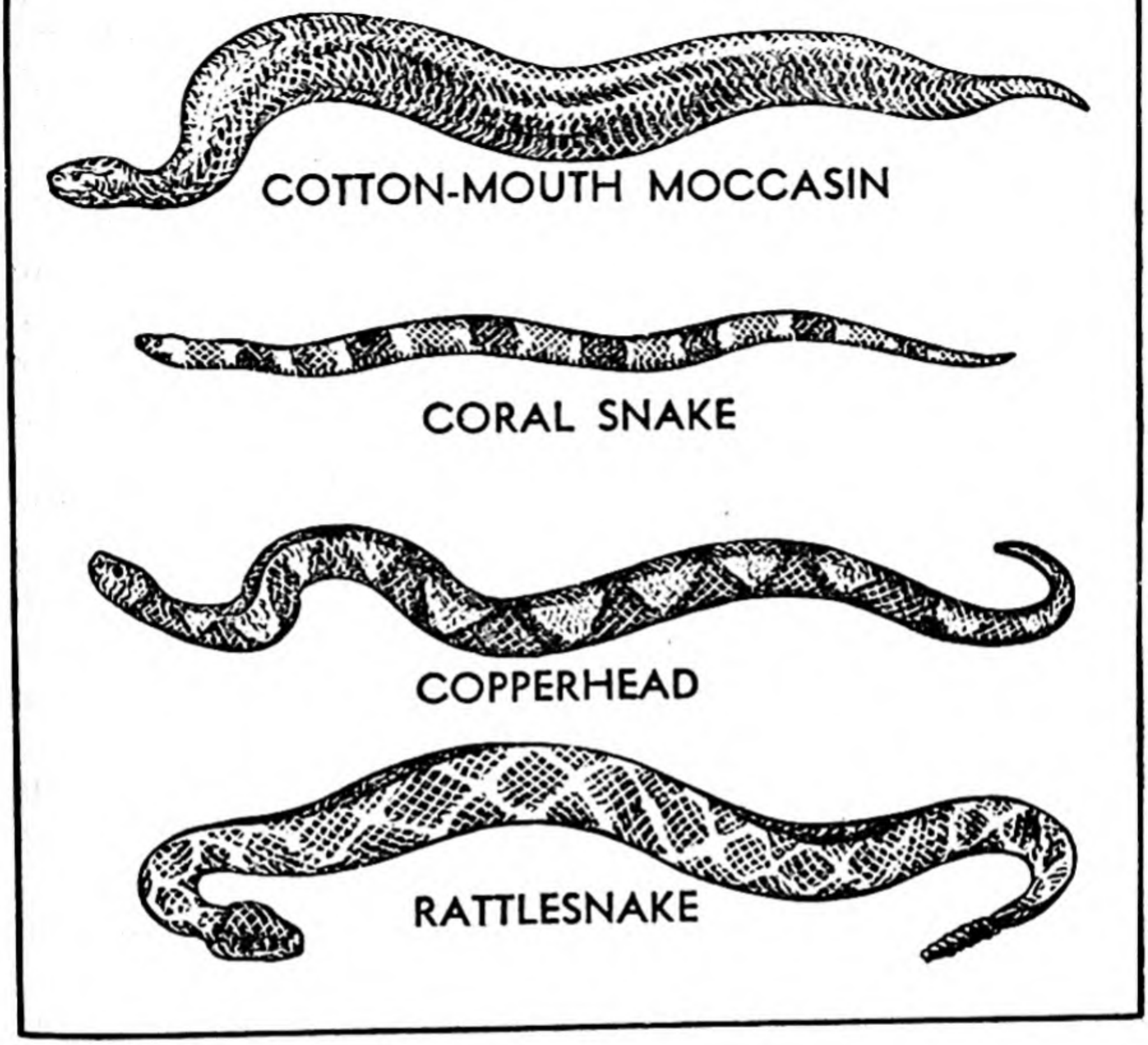


Figure 32

ness, and often nausea and vomiting. Since the poison is absorbed slowly, except in the rare instances when it is injected directly into a vein, there is a very good chance of saving the victim's life if prompt first-aid measures are started at once.

What to Do. Make the victim lie down and keep very quiet, to slow the circulation and retard absorption of the poison. Try to allay his fears by reminding him that the bite of an American snake is seldom fatal. Tie a constrict-

ing bandage several inches above the fang marks, to keep the poison from spreading. Use whatever is at hand—a roller or cravat bandage, handkerchief, necktie, strip of cloth torn from the clothing, or similar material. Tie the bandage tight enough to constrict the veins below it so that they stand out, but not tight enough to constrict the arteries. The object of this is to retard the flow of poisoned blood into the superficial veins and yet not cut off the blood supply to the limb. At twenty-minute intervals loosen the bandage for a minute and then retighten. As the swelling extends upward, move the bandage higher up the limb.

After applying the constricting bandage, sterilize a knife tip, scalpel, or razor blade by holding it in the flame of a burning match, paint the area surrounding the wound with iodine or alcohol, and make a cross-cut in the shape of the letter *X* about an eighth of an inch deep and a half inch long through each fang mark or connecting the two punctures. Do not cut large visible veins, if you can help it. The object is to insure free bleeding but not to start a hemorrhage. Pressing the edges of the wounds makes them bleed freely. If bleeding is too severe, control it by pressing with the finger below the wound.

Then apply suction for a full half-hour. A suction syringe for applying suction in case of snake bite is included in snake-bite outfits and may be purchased in any drugstore. Directions for using the syringe come with it. When a special suction device is not available, exhaust the air in a bottle, small glass, or cup by burning a piece of paper in it, and then place the mouth of the bottle tightly over the wound. The partial vacuum produces considerable sucking action as the bottle cools. If no other means of applying suction are available, suck the wound and spit out the fluid obtained. Additional incisions may be made around the fang marks, if much swelling takes place.

Keep the victim lying down, warm, and quiet, to prevent or minimize shock. Whisky, contrary to the general notion,

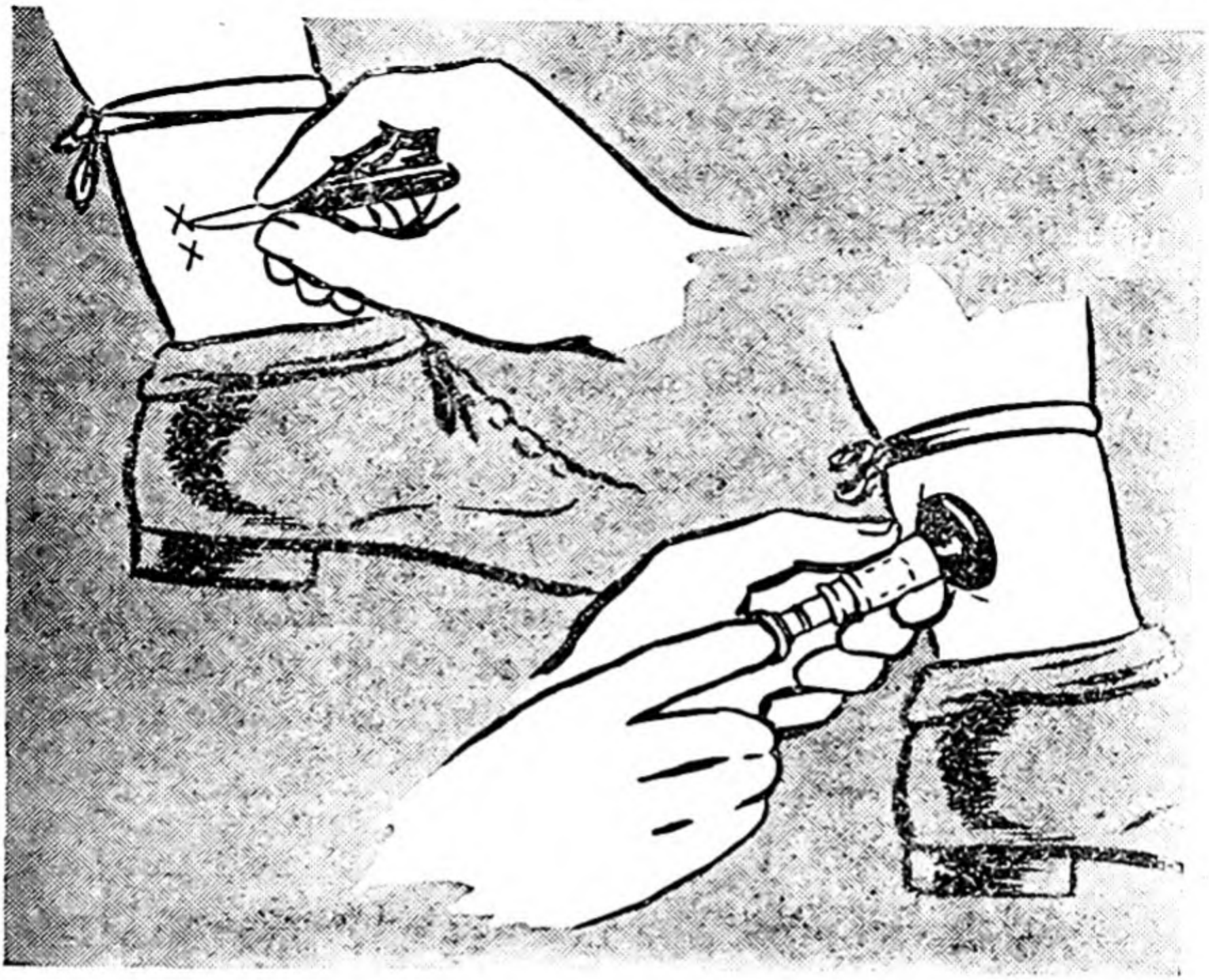


Figure 33

is not a cure for snake bite, and has no value as a stimulant.

An antitoxic serum, known as antivenin, counteracts the venom of poisonous American snakes except that of the coral snake. It may be purchased in a drugstore as part of a snake-bite outfit. Since antivenin is given hypodermically, you must have special instruction in the method of administering it or you may do more harm than good. Even if antivenin is available and you know how to give it, the measures outlined above must also be carried out.

Always secure a physician's aid as quickly as possible. If the victim of snake bite must be taken to a doctor's office or hospital, he must be carried. Moving about speeds up the circulation of blood and thus hastens the absorption of the poison.

BLAST INJURIES. *See* page 326.

BLEEDING. HOW TO STOP IT

1. *If not severe,* cover the wound with a sterile compress and bandage it tightly in place or press with the hand or finger over the compress until the bleeding stops.

2. *If severe,* press with the fingers or thumb on the correct arterial pressure point, as shown in the diagrams which follow, Figures 34-39.

Figure 34. Bleeding of the head above the eyes. Press just in front of the ear.

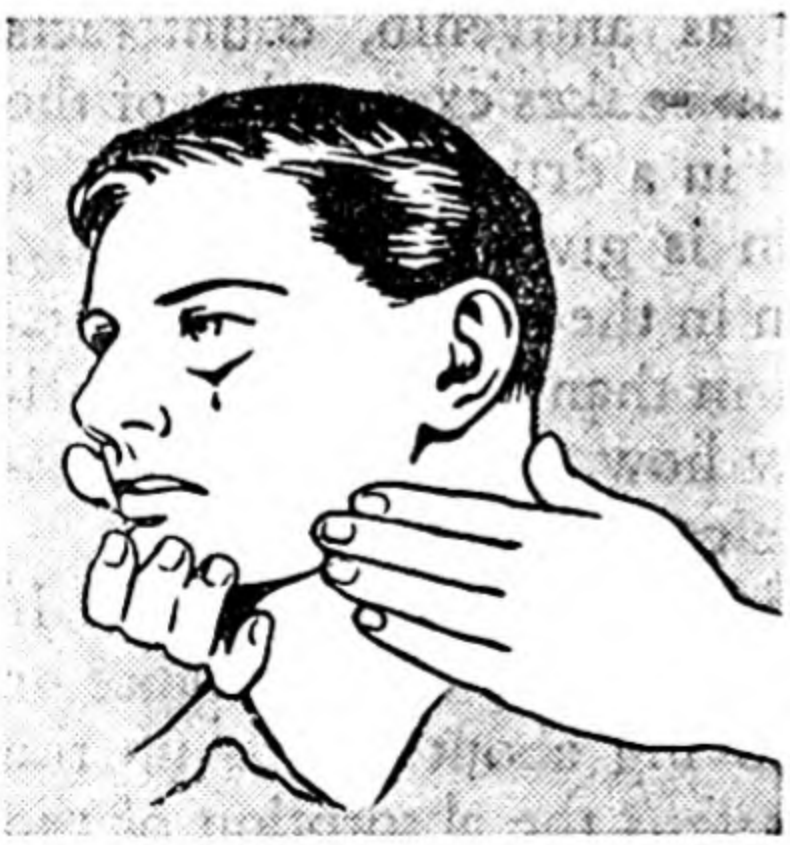


Figure 35. Bleeding of the cheek below the eyes. Press in the notch on the side of the jawbone which is from one inch to one and a half inches in front of the angle of the jaw.

Figure 36. Bleeding from the neck or throat. Place your thumb against the back of the victim's neck and your fingers in the depression at the side of the windpipe (not over it). Press the fingers and thumb toward each other.

Figure 37. Bleeding from the shoulder, armpit, and upper part of arm. Place your thumb or fingers in the hollow behind the victim's collarbone, and press against the upper surface of the first rib.

3. If bleeding from the extremities (arms and legs) cannot be controlled by the pressure methods described here, apply a tourniquet. For directions and necessary precautions, see pages 80-83.

4. If for any reason pressure over a compress, digital (finger) pressure, or pressure by tourniquet cannot be applied, do not hesitate to press with the thumb, fingers, or hand directly over the bleeding point. As soon as possible replace the fingers with a sterile compress, freshly laundered

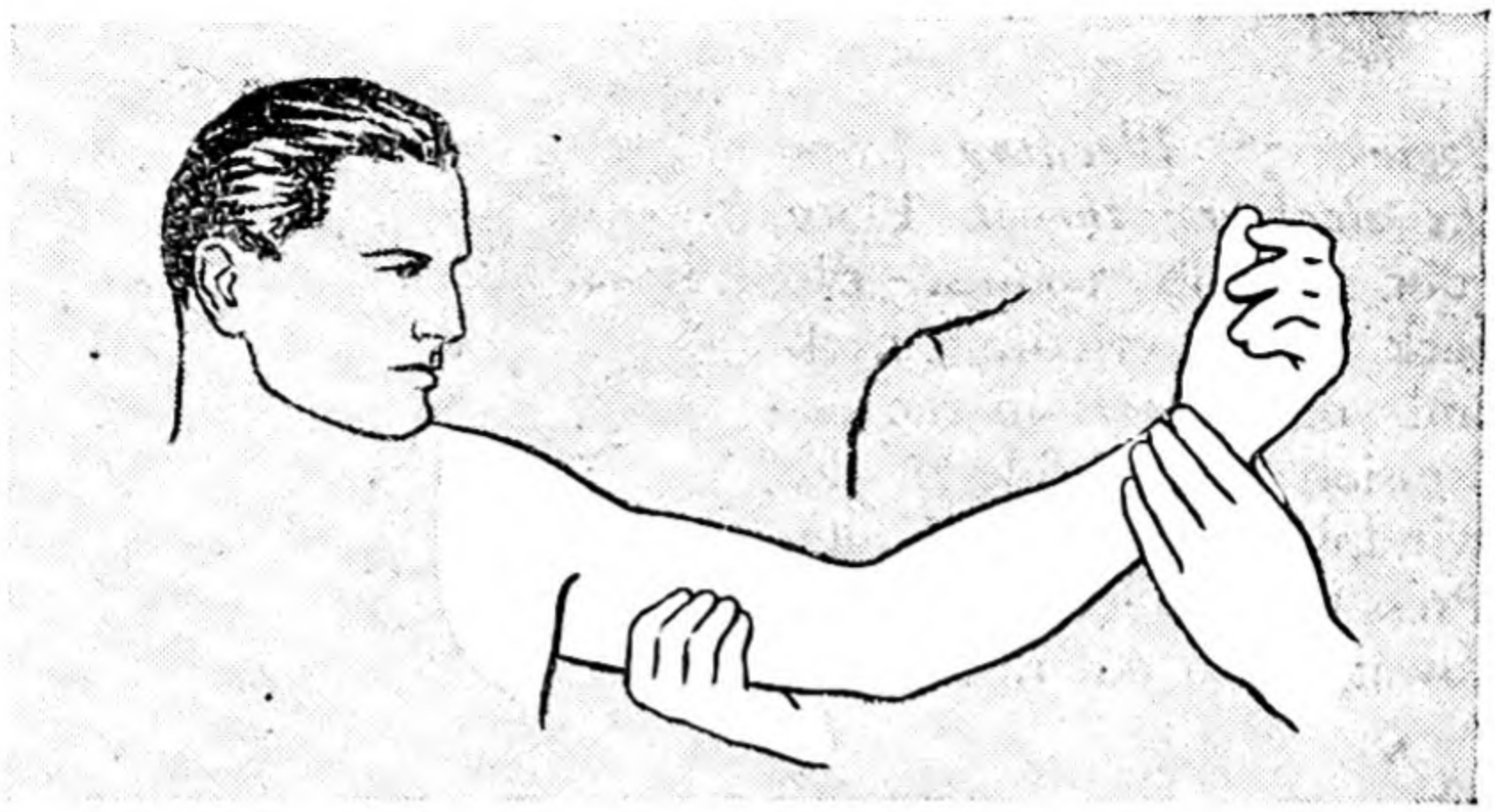


Figure 38. Bleeding from lower two thirds of arm, and hand. Place your fingers on the inside of the arm at a point halfway between armpit and elbow, and press fingers and thumb toward each other with the armbone between.

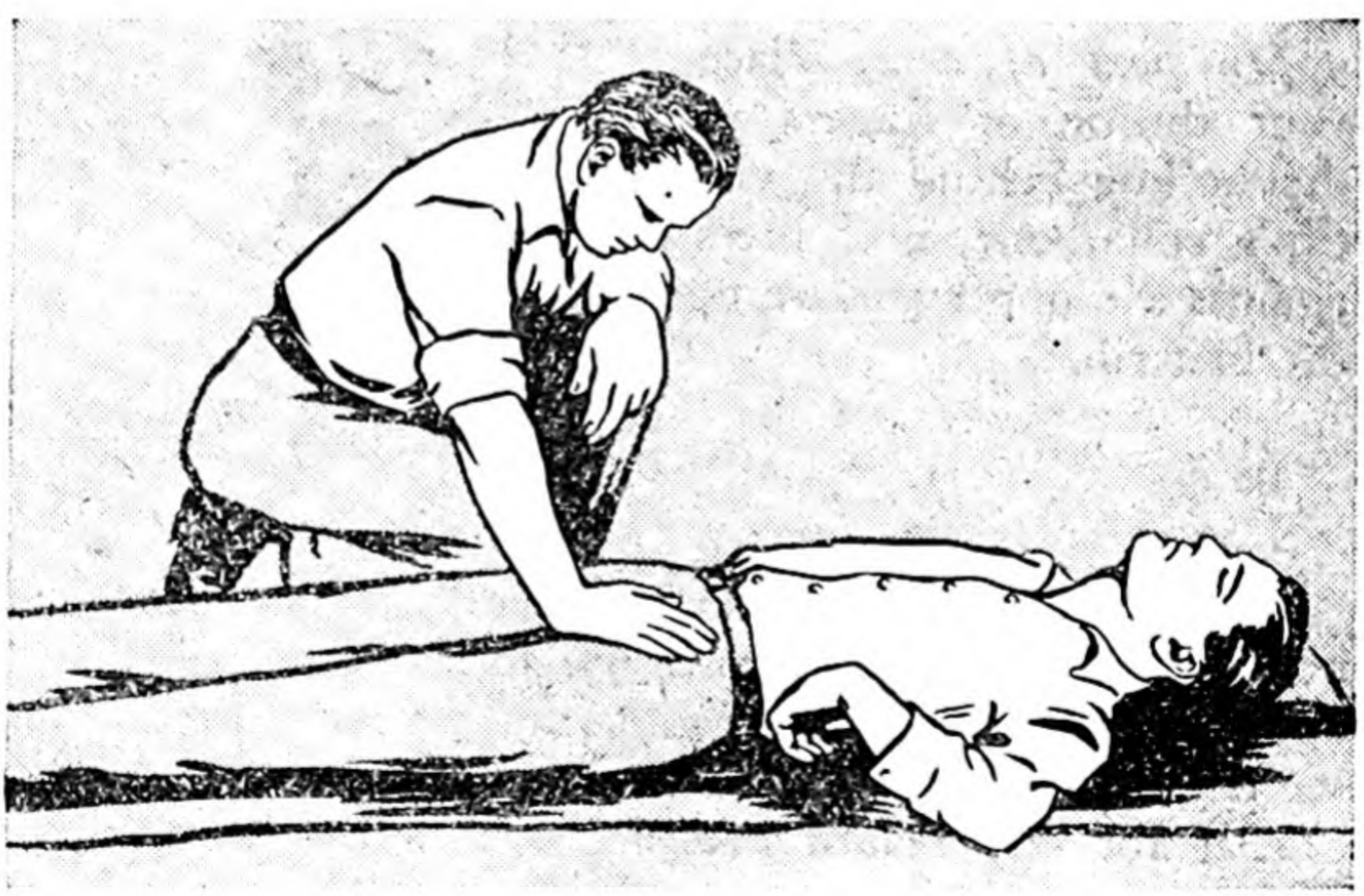


Figure 39. Bleeding from the thigh, leg, or foot. Place the heel of your hand just below the victim's groin at the point indicated, and press downward.

handkerchief, or similar material.

A more comprehensive discussion is given in Part II under Bleeding, pages 72-85.

BLEEDING, EXTERNAL, SIGNS OF, ARTERIAL. *See* page 74.
CAPILLARY. *See* page 74.
INTERNAL. *See* pages 84-85.
VENOUS. *See* page 74.
BLEEDING, INTERNAL. *See* pages 84-85.
ABDOMINAL. *See* page 320.
BOWELS. *See* page 84.
LUNGS. *See* pages 84-85.
NOSEBLEED. *See* page 239.
STOMACH. *See* page 85.
BLISTER GASES (used in chemical warfare). *See* pages 336-341.

BLISTERS

Cause. A blister is caused usually by pinching or chafing the skin. In a "water blister" only the upper layers of the skin are involved, and the fluid which collects is lymph. In a "blood blister" capillaries in the lower layer of the skin are ruptured, and the fluid in the blister consists of a mixture of lymph and blood.

What to Do. The unbroken skin over a blister is a protection against infection. Cover a small blister with sterile gauze fastened in place with adhesive tape and leave it alone. However, it usually is best to forestall the accidental rupture of a large blister by opening it under antiseptic conditions. To do this, apply a little 2% iodine at the edge of the blister and then puncture it with a needle sterilized by passing it through a flame. Then press gently on the outside margins to drive out the fluid. Cover the blister with a sterile dressing.

In a "raw" blister the sensitive living layer of the skin is exposed. Do not use iodine. The least painful cleansing agent is a saturated solution of boric acid (two teaspoonfuls

of boric acid crystals in a glass of water). Use sterile cotton swabs wet with this solution to cleanse the raw skin area and then cover with a sterile dressing.

If a blister becomes inflamed or shows evidence of infection, consult a physician.

BLOOD POISONING. *See* Wound Infection, pages 315-317.

BOILS

There are two kinds of boils. One kind is the simple boil or furuncle, with one core. It may be no more than a pimple. The other kind is the far more serious carbuncle, with several cores.

Cause. Most boils are caused by the infection of one or more of the tiny pits from which hairs grow (hair follicles). The bacteria which cause boils are almost always present on the skin. Ordinarily they do no harm unless irritation of the skin permits them to get a foothold. That is why boils usually occur at points where clothing chafes the skin, as on the back of the neck, in the armpits, and on the buttocks. "Bad blood" does not cause boils. The infection in every case comes from without, but a run-down condition of the body, or diabetes, or a diet deficient in vitamin B-complex may make a person more than usually susceptible to infection. The doctor may advise immunization with material taken from the victim's boils (autogenous vaccine) or X-ray or radium treatments.

What to Do. Never squeeze or pinch a boil or pimple. The body cells build up a wall about the site of the infection to keep it from spreading. Squeezing may break down this wall and permit the bacteria to enter the blood stream and cause blood poisoning. Compresses wet with a hot salt solution or ichthyol (purchased in a tube from a druggist) may be used to relieve pain and to hasten the formation of pus in a simple boil or pimple—that is, to "bring it to a head." It then usually "breaks" by itself and evacuates the pus in

the core. It should be kept covered with a sterile compress until it heals. *Do not use poultices of any kind to bring a boil to a head.*

If a boil is large or very painful, consult a physician without delay. It may be a carbuncle, and a carbuncle is not an infection to fool with.

BOMB-FRAGMENT WOUNDS. *See under:*
PUNCTURED WOUNDS, page 319.
TRUNK WOUNDS, page 320.
WAR INJURIES, pages 323-324.
BOMBS, HIGH EXPLOSIVE (used in warfare). *See* pages 323-326.
BOMBS, INCENDIARY (used in warfare). *See* pages 327-329.
BORIC-ACID POISONING. *See* Poison Table, page 254.
BOTULISM. *See* Food Poisoning, Botulism, pages 183-185.
BOWELS, BLEEDING FROM. *See under:*
ABDOMINAL WOUNDS, page 320.
INTERNAL BLEEDING, page 84.
BRAIN, CONCUSSION OF. *See* Skull Fracture *under* Fractures, page 208.

BREATH-HOLDING

An infant or young child in a fit of temper may hold his breath until he is "blue in the face." There is nothing to worry about in this, as the child will be forced to take a breath before his oxygen supply becomes dangerously low. To hasten the course of nature throw cold water in the child's face.

BROKEN BONES. *See* Fractures.
BROMBENZYLCYANIDE (a tear gas used in chemical warfare). *See* page 342.
BROMIDE POISONING. *See* Poison Table, page 254.

BRUISES

A bruise is caused by a fall or a blow which ruptures the

capillaries in the skin without breaking the surface of the skin.

Signs. A bruise is first red and swollen, due to the oozing of blood into the tissues. It becomes discolored—"black and blue"—as the blood clots. A "black eye" is a bruise.

What to Do. Apply cloths wrung out of cold water or chilled on a piece of ice to relieve the pain and swelling. If the blow or fall resulting in a bruise was severe, consult a physician.

BULLET WOUNDS. *See under:*
PUNCTURED WOUNDS, page 319.
TRUNK WOUNDS, page 320.

BURNS AND SCALDS

A burn is caused by the heating of the skin to the reddening point, the blistering point, or the cooking point. The agents which most commonly cause burns or scalds are fire, hot objects, hot metals, scalding liquids, steam, electricity, and the direct rays of the sun.

Classification. Burns are classified according to the degree or depth to which the tissues are injured.

In a first-degree burn, the skin is reddened and unbroken.
In a second-degree burn, the skin is blistered and usually broken.
In a third-degree burn, the skin and underlying tissues are actually charred or "cooked."

Burns also are classified, according to the extent of the area burned, as *limited burns* and *extensive burns.* The danger from an extensive burn is much greater than from a limited burn, regardless of the degree of the burn. For example, an extensive second-degree burn is more dangerous than a small third-degree burn. This is true because extensive burns always cause severe shock, which may re-

sult in death unless measures are taken to combat it.

The purposes of the emergency care of burns are: *first,* to save life, if life is endangered by shock; *second*, to relieve pain; and *third,* to prevent infection.

What to Do for Limited Burns. Apply a sterile compress spread with a paste of sodium bicarbonate (baking soda) and water, or apply several layers of picric-acid gauze moistened with clear warm water, and bandage lightly but firmly in place. If the skin is blistered but not broken, take great care not to rupture the blisters. Burn blisters should be opened only by a physician. If the skin is merely red and not blistered or broken, tannic acid jelly, boric-acid ointment, olive oil, or vaseline may be used to relieve pain.

If the skin is blistered or broken, do not use any substance which cannot easily be washed off or soaked off. It is extremely difficult for a physician to cleanse and to make ready for a permanent dressing a second-degree or third-degree burn which has been covered with flour, absorbent cotton, or any oily or greasy substance. Besides, if the substance used is not sterile, the chance of infection is greatly increased. Remember that a burn in which the skin is broken is a wound, just as a cut is a wound.

Third-degree burns, even when small, are likely to become infected and leave disfiguring scars. For that reason, the first-aid care of all deep burns is only a preliminary measure. The thorough cleansing and permanent treatment required must be carried out by a physician.

What to Do for Extensive Burns. Extensive burns, no matter what the degree, are extremely serious. Burns in which one third or more of the body surface is involved are usually fatal. The severe pain and the destruction of the skin (the chief conserver of tissue fluid and body heat) are responsible for the shock and lowering of body temperature which follow an extensive burn. The greatest relief from pain is obtained by immediately excluding air from the burned area. Warmth and quiet are necessary to

combat shock, and sweet, warm drinks in moderate amounts at frequent intervals may be helpful.

Immersion Method. Immersing the burned area in warm water (about 85° F.) will shut out the air and help to ward off shock by relieving the pain. Also, the clothes over the burned area can be removed most easily under water. *In removing clothing from burned skin, do not try to pull away any part that sticks.* Use scissors to cut around it.

In severe burns involving a large area of the body, put the victim, clothes and all, into a bathtub filled with warm water. Keep the water constantly running in and out. Remove as much of the victim's clothing as possible, working slowly and carefully. After the clothes and obvious dirt have been removed, plug the outlet of the tub and add sodium bicarbonate (baking soda) to the water. Keep the victim submerged with his head supported until the arrival of the doctor. If it is necessary to remove the victim from the tub, wrap him in a freshly laundered sheet wet with warm baking-soda solution (two or three tablespoonfuls to a quart of water), and then in blankets. The latter procedure may be followed after as much clothing as possible has been removed, if immersion is not practicable.

If the burn is on the arm or leg, lower the limb gently into a large clean container filled with clean warm water to which baking soda or Epsom salts has been added in the proportion of two tablespoonfuls to a quart of water. Keep the victim warm with blankets.

Wet-Compress Method. If it is not possible to immerse the burned area in water, the wet-compress method should be used. Soak several layers of sterile gauze or freshly laundered cloth (for example, towels, pillowcases, or strips torn from a sheet) in a warm baking-soda or Epsom-salts solution and bandage it lightly over the burned area. Wet-compress dressings must be kept wet. This may be done by occasionally pouring some of the solution used under the edge of the bandage.

Picric-acid gauze also makes a good emergency dressing for extensive burns. Remove the gauze from the package, unfold it carefully so as not to contaminate the surface to be applied next to the burned area, moisten it with warm clean water, bandage loosely into place, and keep the dressing moist. In all cases cover the victim with blankets to keep him warm.

BURNS, BANDAGING

An important point to remember in applying burn dressings is that adjacent burned surfaces must not be permitted to touch each other. Raw skin surfaces touching each other will stick together and may be separated only with great difficulty. Burned areas between fingers and toes, between the ears and the side of the head, between the arms and the chest wall, the folds of the groin, and similar areas must always be separated with burn dressings before the bandage is applied.

Bandages to hold burn dressings in place over burned areas are applied as described under Bandaging, pages 107-122. Special bandages for burns of the face, neck, or head are applied as follows:

First apply a moistened burn dressing as described under the "wet-compress method." Be sure to place moistened gauze between the ears and side of the head if these areas are burned. Cover the dressing with a bandage as follows: Place the base of one triangular bandage over the top of the head toward the back and let the apex hang down over the face and chin. Cross the ends at the back of the head below the "bump," bring them around to the front, and tie loosely over the apex below the chin. Place the base of a second triangular bandage over the top of the head toward the front and let the apex hang down over the back of the head and neck. Cross the ends under the chin, bring them around to the back of the neck, and tie loosely. Now place the center of a cravat bandage at the back of the neck and

tie in front. Cut a small hole over the nose in the bandage covering the face, so that the victim can breathe. If the eyes are not burned, eyeholes may also be cut.

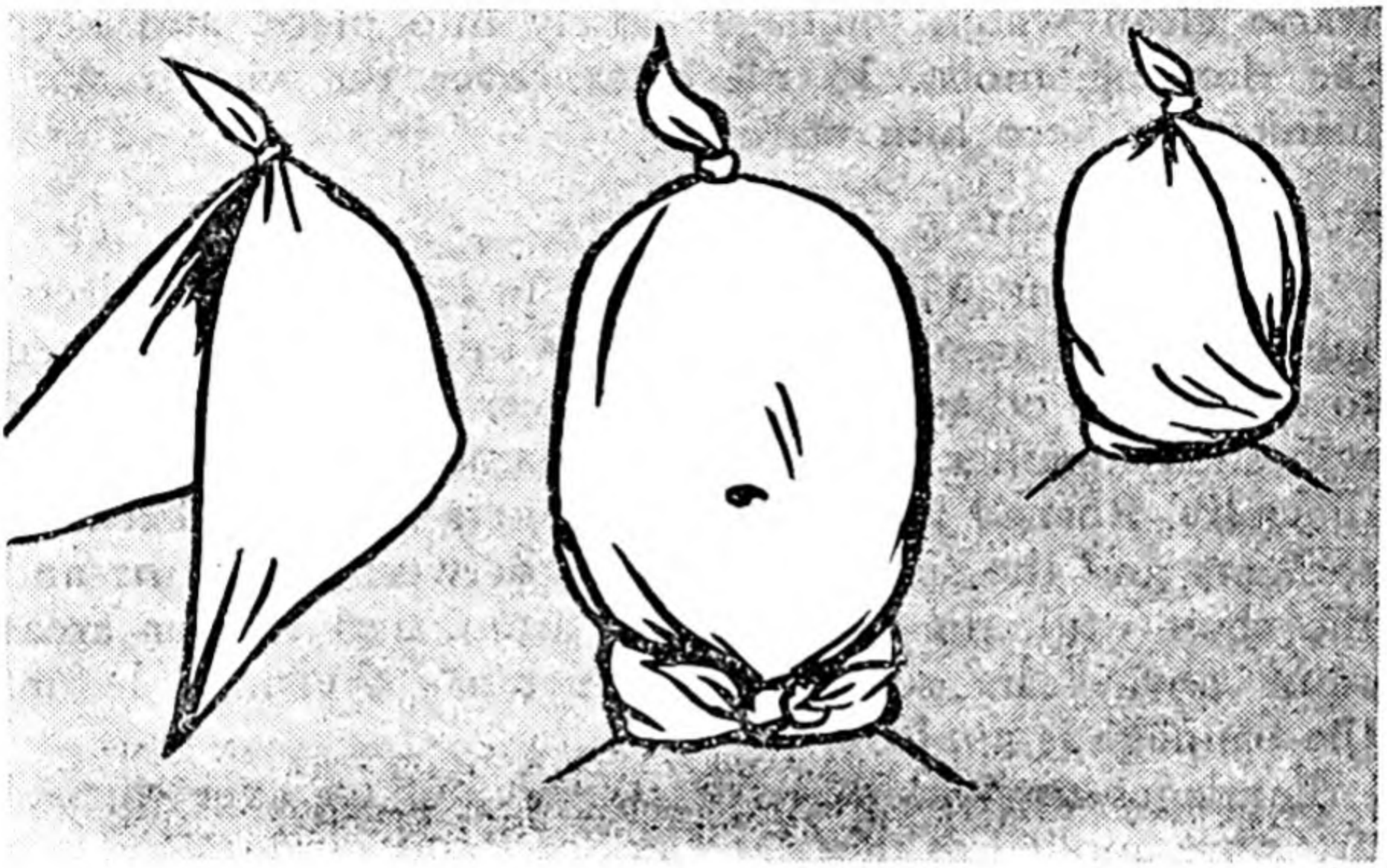


Figure 40. Mask Bandage for Burns of the Face or Back of Head. Tie a knot in a triangular bandage about six inches below the apex. Place the bandage on the head with the knot at the crown of the head and the base drawn down over the face and chin to the neck. Carry the ends to the back of the neck, cross, and bring back to the front. Tie under the chin. Cut small holes or slits for the eyes and nose if they are not injured. Apply the bandage the other way around for burns of the back of the head.

BURNS, CHEMICAL

Destruction of tissue by the action of strong acids and alkalis is called a chemical burn.

Treatment. Immediately strip off all clothing which has come in contact with the chemical and drench the burned

area continuously with *large quantities of clean water.* If there has been any delay, do not use water. Get medical aid at once. Carbolic-acid burns should first be washed with rubbing alcohol, whisky, or brandy, if it is available.

Give first aid according to the degree of the burn if further care is required before the doctor arrives.

For chemicals in the eye, see Eye, Chemicals in.

BURNS, ELECTRICAL

An electric current streaking through the body burns the tissue as it goes. The wound on the surface of the body may be small in comparison with the trail blazed in the interior. These burns are always deep, painful, and slow to heal. After giving care for electric shock (*see* Electric Shock) take the steps described for burns of limited extent (page 139). Further treatment must be given by a physician.

Burns caused by a flash of electricity usually are not deep. Give first-aid care for limited or extensive burns as the case may be.

BURNS, HOT-LIQUID

Burns caused by contact with very hot water or steam are called scalds. Handle as for any other burn, according to the degree and extent.

BURNS, HOT-OIL OR HOT-METAL

Viscous liquids, such as hot fat or oil, molten metal, hot pitch, and hot wax, cause very painful burns. Burns from molten metal, such as thermit, and flaming oil are common among civilians during enemy attack by incendiary bombs. In injuries of this kind the hot liquid or molten metal usually falls or flies out in drops and burns its way into pockets in the flesh where it cools and sticks fast. *Do not try to dislodge it.* Immediately flush the area involved with large quantities of water to cool the droplets, and consult a physician.

See also under War Injuries, page 328.

BURNS, PHOSPHORUS (from white phosphorus released in the explosion of incendiary phosphorus bombs and smoke shells). *See* War Injuries, page 329.

BURNS, POWDER

Common causes of powder burns are exploding fireworks, blank-cartridge pistols, cap pistols, and the like. The burn in most cases is not so dangerous as are the innumerable tiny puncture wounds made as the powder penetrates the skin. If tetanus germs are present on the skin or clothing (see Tetanus), they may literally be punched into the tissues by the powder. For that reason it is extremely important for the victim of a powder burn to consult a physician without delay, so that tetanus antitoxin can be administered if he thinks it advisable. If the skin is burned, first-aid care consists of relieving the pain by the wet-compress method (page 140).

C

CAMPHOR POISONING. *See* Poison Table, page 254.

CAPILLARIES, CONTROL OF BLEEDING FROM. *See* page 84.

SIGNS OF BLEEDING FROM. *See* page 74.

CARBOLIC ACID, BURNS. *See* Burns, Chemical.

POISONING. *See* Poison Table, page 254.

CARBON-MONOXIDE ASPHYXIATION. *See* Gas Asphyxiation.

CARBUNCLES. *See* Boils.

CARRIES FOR TRANSPORTING THE INJURED. *See* Transportation of the Injured.

CAT BITES. *See* Bites, Animals.

CAUSTIC ALKALIS, BURNS. *See* Burns, Chemical.

IN EYE. *See* Eye, Chemicals in.

POISONING. *See* Poison Table, page 251.

CHEMICAL POISONS SWALLOWED. *See* pages 86-91. If the poison swallowed is known, see under name of poison in Poison Table, pages 250-266.

CHEST, BANDAGING. *See* Bandaging, page 121.
CHEST INJURIES, FRACTURE OF RIBS. *See* page 212.
LUNGS, BLEEDING FROM. See page 84.
See also WAR INJURIES, pages 323-326.

CHILDBIRTH, SUDDEN

Even in peacetime it is not unusual for a new baby to arrive before the doctor can get to the scene of action. Occasionally a baby is born while the mother is on the way to the hospital in a public conveyance or in some public place, especially if she has been involved in an accident or has had a scare of some kind. In wartime a baby may start to arrive during an air raid or blackout, when it is difficult to get a doctor right away or to get to the hospital. For that reason it is advisable both for the expectant mother and her family and for first-aid workers to know what to do in case of sudden childbirth.

Be Prepared. Some time before the baby is due to arrive, pack a box, carton, or suitcase with all the things that will be needed for the care of the mother and baby during childbirth. Place a flashlight with extra bulbs or candles and a box of matches near the box of supplies, in case the baby is born during an air raid or blackout when the electricity is cut off.

Signs and Symptoms of Approaching Labor. Labor pains usually begin in the small of the back and in time turn into regularly recurring cramplike pains in the lower abdomen. Gradually the intervals between pains grow shorter, and the pains increase in strength. *They come and go at regular intervals*. A slight, watery bloodstained discharge which may accompany labor pains or occur before the pains begin is another sign that the baby is coming. Sometimes the bag of water surrounding the baby breaks before labor begins, but this does not usually happen until several hours after the first pains.

What to Do in a Wartime Emergency if Labor Begins

at Home. The mother or a relative or friend should call the doctor if she is *positive* that labor is beginning. Remember that only emergency telephone calls are permitted during an air-alarm "alert." Tell the doctor (1) when the pains began, (2) how often they are coming, (3) whether the "waters" have broken, (4) whether there is any bleeding.

While waiting for the doctor, do the following things: Put water in a covered kettle on the stove to boil. Have one or two additional covered kettles filled with water ready for boiling.

Unpack the emergency box or carton and make the mother's bed and the baby's bed. To protect the mattress of the mother's bed, place a rubber sheet, piece of oilcloth, or clean brown wrapping paper under the sheet and three newspaper pads (made by covering twelve thicknesses of full-size newspaper with clean old muslin) on top of the sheet overlapping at about the center of the bed toward the outside edge (Figure 41).

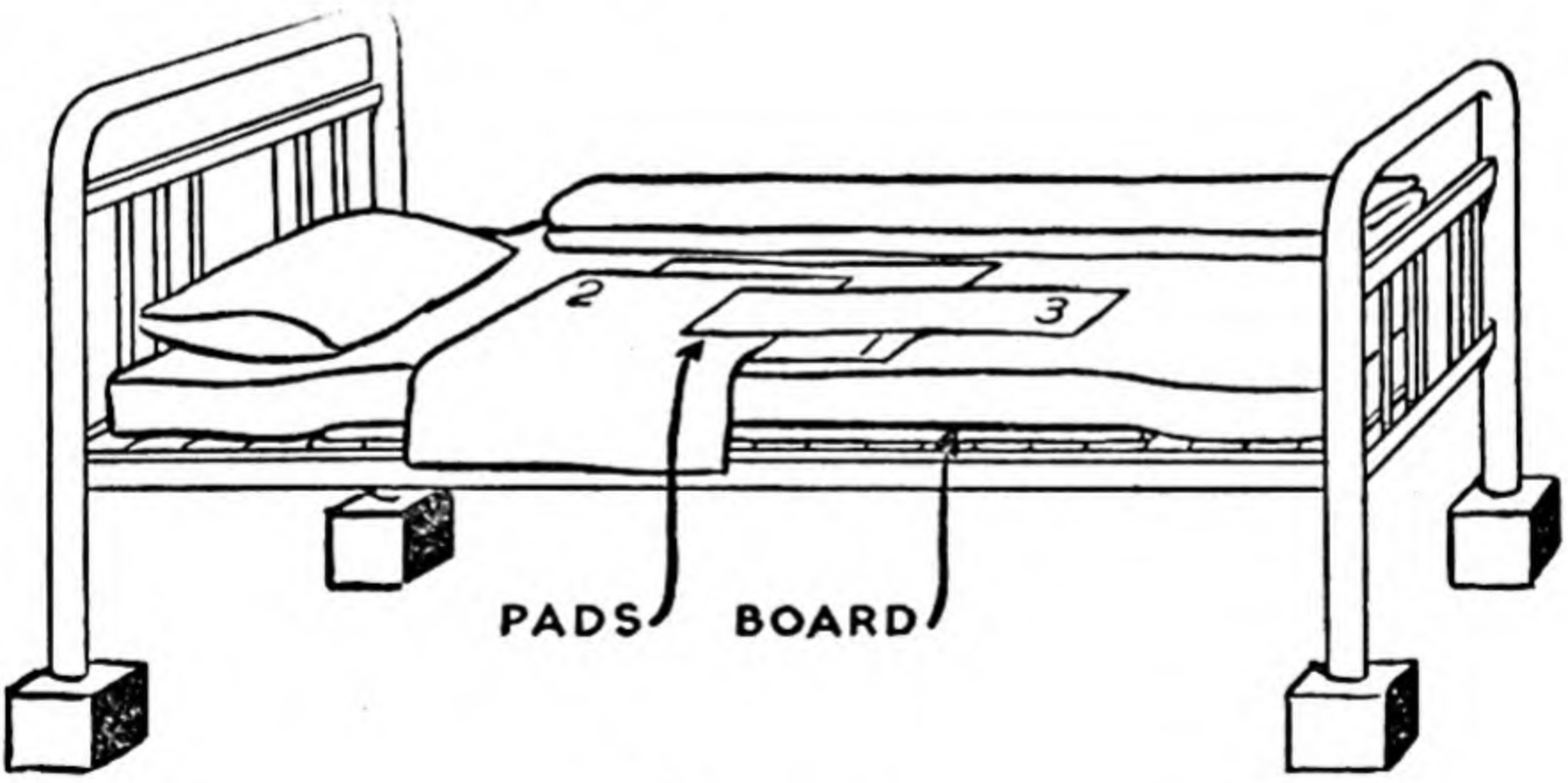
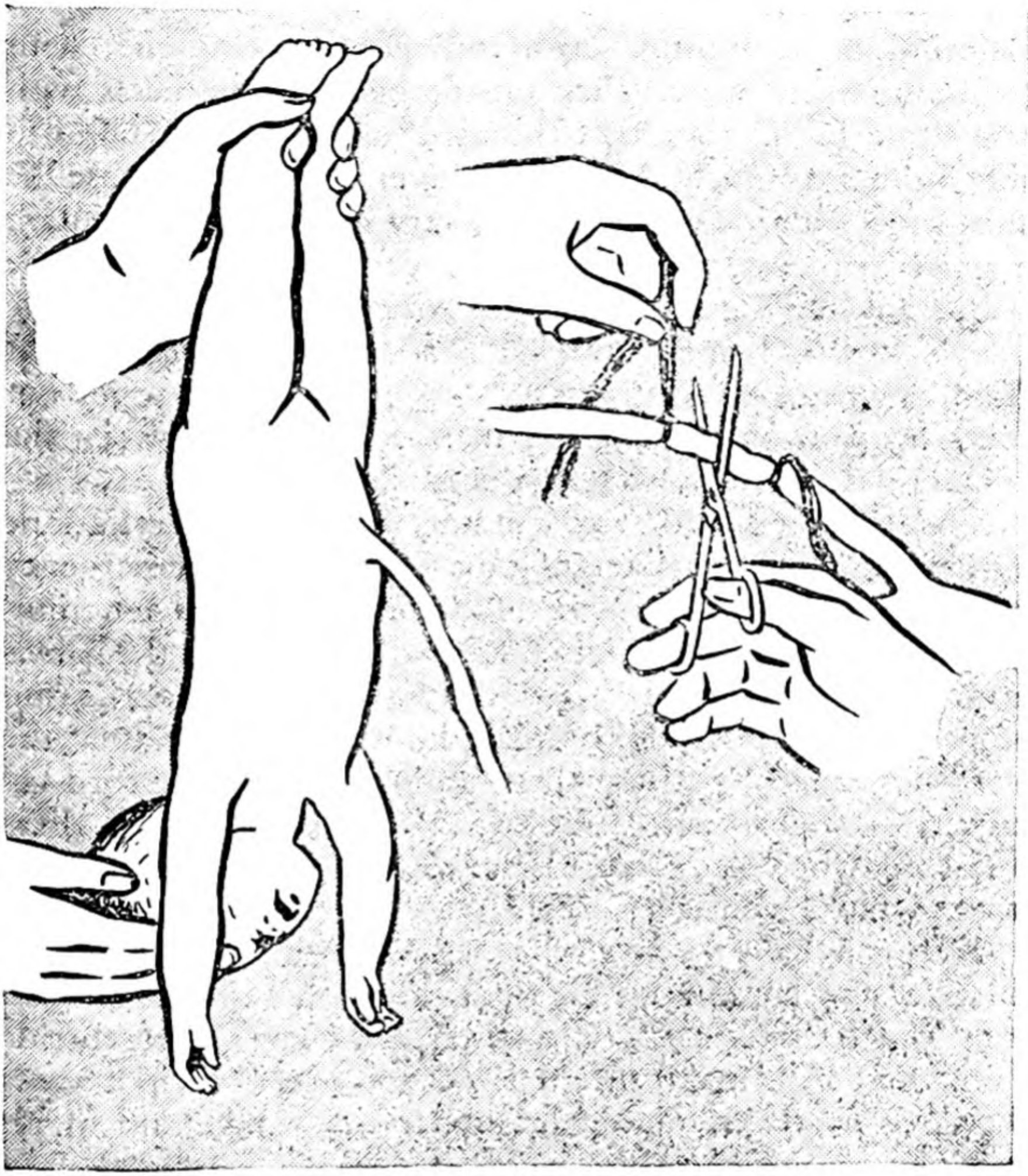


Figure 41

Place the boiled water and two basins near the bed. Lay out the other supplies, ready for use, in a convenient place.

Keep calm. Remember that most babies are born without



a *b*

Figure 42

great difficulty. If the baby comes before the doctor does, the mother should lie still and let the person who is helping her do the rest. The important things for her are warmth and quiet.

What the Helper Should Do After the Baby Is Born. Before doing anything, scrub your hands thoroughly with soap and warm water. Pick up the baby by the heels with one hand, taking care that the cord* attaching the child to the mother is slack. Hold him over the bed in case he slips from your grasp—he will be very slippery. To maintain a good grip, insert one finger of your hand between the baby's ankles (Figure 42*a*). Place your other hand under the baby's forehead and bend his head back slightly so that fluid can run out of his mouth. When the baby cries out loud, lay him on a clean, dry blanket or cloth between the mother's flexed legs, with the cord slack.

Then proceed to tie and cut the cord, using sterile tape (from the sealed package of tape in the box of emergency supplies) and sterile scissors (scissors boiled for ten minutes). Tie one piece of tape about two inches from the baby's navel and another piece about two inches farther along toward the mother. Make square knots and be sure that the cord ties are so tight that they cannot slip. Cut the cord between the two knots (Figure 42*b*). The doctor will dress the cord when he arrives. If he cannot get there for some time, wrap the end of the cord with a piece of sterile gauze.

Keep the baby warm and quiet. Wrap him in a warmed blanket and lay him on his right side in his bed where you can watch him. Place a covered hot-water bottle beside him. Test it to make sure it is not too hot. If no hot-water bottle is available, place him under the blanket up to his neck beside his mother.

The afterbirth or placenta may not come right away. Do not try to expel it by pulling on the cord. After the afterbirth has come, slide out the soiled newspaper pad and wrap it up with its contents for the physician to examine.

* IMPORTANT NOTE: If the cord is wrapped around the baby's neck when his head and neck appear during delivery, try to slip the cord over his head so that he will not be strangled. If this cannot be done, tie the cord in two places, two inches apart, and cut between the ties. Then unwind the cord from around the baby's neck.

Then place your hand on the mother's abdomen just below the navel. You should feel a hard lump about as big as a large pear. This is the contracted uterus. If you do not feel it, massage the abdomen firmly and gently until you do. If the uterus does not contract, there is danger of hemorrhage. Gentle massage stimulates a relaxed uterus, causing it to contract.

Have the mother lie on her back with her knees raised and her legs together. Keep her warm with blankets and external heat, and give her a warm (not hot) drink of sweetened tea, milk, or bouillon.

What to Do if Childbirth Begins in the Street, Public Conveyance, or Other Public Place. If there is time, take the mother to the nearest place where it is possible to secure shelter and seclusion. If not, do the best you can under the circumstances. It is sometimes possible to rig up a shelter with coats contributed by those present. Send at once for a doctor and an ambulance. Until they arrive, keep the mother lying down with blankets or coats placed over and under her to prevent chilling. If possible, give her warm, sweetened drinks *but no drink containing alcohol*. Do nothing more unless the baby is born before medical aid arrives.

If the baby is born while the mother is under the care of the first-aid worker, hold up the baby by its feet until it cries as described on page 148. If there is good reason to expect the quick arrival of a doctor, do not cut the cord, but have the mother lie on her back and place the baby on its right side between the mother's legs and close enough to the mother to keep the cord from being pulled upon by the movements of mother or child. Keep both mother and baby warm, but make sure that the baby is not smothered by the coverings.

If it is necessary to cut and tie the cord (and this should be done about five minutes after the child is born), the precautions to take will depend upon the facilities available. If a drugstore or first-aid station is near by, sterile

tape and sterilized scissors may be obtained. In an emergency a knife or scissors for cutting the cord may be sterilized by passing the blades through the flame of a match. When sterile tape is not available or strips of cloth or cord cannot be sterilized in boiling water, the cleanest possible material—for example, narrow strips torn from a freshly laundered handkerchief—may be used to tie the cord. When the cord has been tied with nonsterile material, it must be tied again under aseptic conditions by a physician at the earliest possible opportunity.

CHILLS

Cause. Chills ordinarily are a prelude to fever. Thus they are a sign of a beginning illness, usually of an infectious nature. Malaria and pneumonia are two common infections in which the fever is preceded by a chill. It is believed that the toxins produced by the invading bacteria or parasites act on the "thermostat" in the brain so that the heat-control mechanism of the body is upset. The immediate result is that less blood flows through the skin and the cold receptors located there send messages to the brain which produce a false sensation of coldness. The shivering, teeth chattering, "blue-with-cold" signs of a chill are the natural reaction.

What to Do. Put the person to bed in a warm room. Wrap him in warm blankets and keep him quiet. Call a physician at once.

CHLORACETOPHENONE (a tear gas used in chemical warfare). *See* page 342.
CHLORAL-HYDRATE POISONING. *See* Poison Table, page 255.
CHLORINE (a lung-irritant gas used in chemical warfare). *See* page 334.
CHLOROPICRIN (a lung-irritant gas used in chemical warfare). *See* page 334.

CHOKING

Cause. Choking is caused by any obstruction of the phar-

ynx (back of the throat) or upper windpipe which blocks the passage of air into the lungs. The obstruction may be anything which constricts the neck from the outside, as a rope in hanging or strangling, or an object swallowed which lodges in the throat, as a fishbone, tough piece of meat, false teeth, or a coin.

Signs. A victim of choking becomes blue in the face, coughs or tries to, gasps for breath or stops breathing.

What to Do. If the choking is caused by something constricting the neck, cut the constricting agent quickly. If an object is lodged in the pharynx or windpipe where it can be seen, pass one or two fingers into the victim's throat and try to hook it out. Be careful not to push it further down. If the object is too far down to be removed in this way, slap the victim sharply on the back between the shoulder blades. While doing this, the victim can help by lying crosswise on a bed on his abdomen with his head and shoulders hanging over the side. Hold a child upside down by the heels and slap his back. If the victim is not breathing or breathes with great difficulty after the object has been removed, start artificial respiration immediately (see pages 67-70). In case you are unable to dislodge the object, rush the victim to a hospital or to a physician's office.

CLAVICLE, FRACTURE OF. *See* Fracture of Collarbone, *under* Fractures, page 210.
COCAINE POISONING. *See* Poison Table, page 255.
CODEINE POISONING. *See* Poison Table, Opium, page 260.
COLD, EFFECTS OF. *See:*
FREEZING, GENERAL.
FROSTBITE.
IN SHOCK, pages 95-96.

COLIC

Colic is a sharp, griping pain in the abdomen. Like any kind of pain it is a symptom—not a disease in itself. Among the diseases or misadventures it may indicate are appendi-

citis, gallstones, chemical poisoning, and food poisoning. A colic lasting any length of time demands medical aid. Until the doctor comes, keep the sick person quiet in bed unless measures must be taken to remove its cause, as in poisoning.

COLIC, INFANTILE

There are many different causes of colic in young babies, some of which are air swallowed in the process of nursing, gas formed in the stomach or intestines by the fermentation of sugar, and constipation.

Signs. A baby with colic yells lustily and draws up his knees so that his thighs rest on his abdomen.

What to Do. Hold the baby over your shoulder after each feeding and pat him gently on the back so that he can expel any swallowed air. To help him expel gas in the intestines you may give him a small enema. Colic is usually not serious and the baby tends to outgrow it. If it persists, ask your doctor what to do.

COLLARBONE, FRACTURE OF. *See under* Fractures, page 210.
COMA, DIABETIC. *See under* Diabetes.
COMPOUND FRACTURES. *See under* Fractures, page 186.

CONCUSSION OF THE BRAIN

See Skull Fracture *under* Fractures, page 208, for first aid.

Concussion is an injury to the brain resulting in the swelling of the brain tissues and sometimes in the rupture of blood vessels in the brain. The skull may or may not be fractured. A severe fall or blow on the head is the usual cause of concussion. It is impossible for the first-aid worker to distinguish between concussion and skull fracture, as the signs are similar. Fortunately, it is not important to do so, because first aid is the same for both conditions.

CONJUNCTIVITIS. *See* Eye, Infections of.
CONVULSIONS, EPILEPTIC. *See* Epilepsy.

CONVULSIONS, INFANTILE

Convulsive fits or spasms are common in young children, because a child's nervous system is less mature than that of an adult and hence reacts more violently to stimuli of various kinds. For example, an adult might have the comparatively mild reaction of chilliness or a chill as a result of a disturbance which would cause a baby to have a convulsion. A convulsion, like a chill, a fever, or a pain, is not a disease in itself but rather a sign that something is wrong.

Causes. A convulsion may be brought on by various disturbances. Among the most important are intestinal disorders, such as infant diarrhea; indigestion caused by the overloading of the stomach with indigestible food; rickets, a disease characterized by softness of the bones due to a lack of vitamin D; and the onset of an infectious disease, such as scarlet fever, measles, or pneumonia.

Signs. The attack may come on suddenly without warning, but usually it is preceded by restlessness, twitching, and perhaps grinding of the teeth. The child's body becomes stiff, then the face and limbs begin to jerk spasmodically, sometimes rhythmically; the eyes roll about, and the head is thrown backward. The attack gradually subsides, usually within half an hour, and the child falls into a natural sleep or passes into a stupor. If the convulsion is due to indigestion, it is not apt to recur, but in rickets and intestinal disorders it may be repeated. Death seldom occurs from the convulsion itself except in children weakened by chronic diarrhea or some other condition.

What to Do. Call a physician. Then wrap the child in warm blankets and keep his head cool with cloths wrung out of cold water. This treatment is as effective and considerably less disturbing than the time-honored hot bath.

If the doctor does not arrive promptly, a small enema of warm soapsuds may be helpful. This should be given with a small rubber syringe.

COPPERHEAD BITE. *See* Bites, Snake.

CORAL-SNAKE BITE. *See* Bites, Snake.

CORROSIVES, POISONING FROM. *See* Poison Table, Acids, page 250; Alkalis, page 251; Carbolic Acid, page 254; Iodine, page 258; Mercury Bichloride, page 259; Silver Nitrate, page 265.

CORROSIVE SUBLIMATE (Bichloride of Mercury). *See* Poison Table, page 259.

COTTONMOUTH-MOCCASIN BITE. *See* Bites, Snake.

CRAMPS, HEAT. *See* Heat Cramps.

CRAMPS IN SWIMMERS

A cramp is the involuntary and painful contraction of a muscle. The effect is a tight hard knot in the muscle which for the time being makes it difficult or impossible to move the part of the body affected. A cramp occurs most frequently in the calves of the legs, but also in the foot, upper thigh, hand, neck, and abdomen.

Cramp frequently occurs in swimmers. If the cramp is in the leg or arm, an experienced swimmer usually can get to shore or knead out the cramp while in the water. A cramp in the stomach or abdomen is much more serious. If the swimmer does not get immediate aid, he is likely to drown. The pain of the cramp causes the involuntary drawing up of the knees toward the chest and the drawing downward and forward of the head. In this position the swimmer cannot help himself. The possibility of stomach cramp is one of the most important reasons for not going swimming alone. A stomach cramp usually is the result of swimming too soon after a hearty meal. That is why expert swimmers do not swim for at least two hours after eating.

See also Drowning, Rescue.

CREOLIN POISONING. *See* Poison Table, Carbolic Acid, page 254.

CROUP, SPASMODIC

Spasmodic croup (not the same as membraneous croup, a dangerous complication of diphtheria) is an alarming but usually not dangerous condition characterized by extreme difficulty in breathing. It is common in young children.

Cause. The immediate cause of spasmodic croup is obstruction of the windpipe or pharynx by a plug of mucous secretion. Even though the obstruction is not complete, the throat is thrown into a spasm.

Signs. A child seemingly quite well or with a slight cold wakes up suddenly in the middle of the night with a shrill, whooping cough and begins gasping for breath. His face may turn blue and his eyes become glazed.

What to Do. Wrap the child in blankets and carry him to a warm room. Keep him warmly covered. Wring out a small towel in hot water and apply it to the child's throat. This usually will relieve the throat spasm. If hot water is not available, cold will do. Give one half to one teaspoonful of sirup of ipecac and follow with a drink of water. This will make the child vomit and dislodge the mucous secretion which is causing the trouble.

Inhaling steam also is used to give relief in spasmodic croup. To make a croup tent quickly, place an open umbrella or a table over the child's head and throw a blanket over it. Steam may be conveyed into the tent in various ways. An electric teakettle or coffee percolator placed at the side of the bed may be used to produce steam. Or any sort of heat unit, such as a sterno lamp, electric or gas plate, or an oil burner, may be used to heat water in a teakettle. If no portable heating apparatus is available, two kettles may be employed alternately; when the water in one ceases to steam, it is replaced by the other. Do not continue steaming for more than ten to twenty minutes.

As the child's breathing becomes easier he usually falls

asleep from exhaustion. If he is wet with perspiration, pat him dry, put on dry night clothes, and put him in a dry bed. Do not keep him so warm that he continues to sweat.

CUTS. *See* Cuts and Scratches *under* Wounds, First Aid, page 317.
CYANIDE POISONING. *See* Poison Table, page 256.

D

DEATH, SIGNS OF

It sometimes happens that an unconscious person passes the ordinary and accepted tests for death and yet is not dead. Thus it is important for the first-aid worker to know when to ignore signs of death and persist in his efforts to revive an unconscious person.

The following five signs may be present in suspended animation after submersion, gas poisoning, electric shock, and other accidents causing asphyxia or shock, *although the person is not dead.*

1. Breathing ceases before the heart stops beating—often some time before. If breathing is present, although not apparent, a mirror held before the person's mouth is dimmed by the breath.
2. Heart sounds are absent.
3. The pulse cannot be detected.
4. The pupils of the eyes are dilated and do not react to light.
5. The eyelids are half closed, and the eyeballs are insensitive to touch.

Even when all these signs are present, resuscitation efforts should not be stopped until a physician has made at least three examinations at ten-minute intervals and is then sure that he has specific evidence of death.

There can be little question about the remaining classic signs of death:

6. Cooling of the body. Body temperature falls considerably after death. The rate of fall depends on the temperature at the time of death, the amount of fatty tissue under the skin, the amount of clothing worn, and the temperature of the air or water surrounding the body.
7. *Rigor mortis*. Muscle plasm coagulates after death with the result that the muscles become shorter, harder, and stiffer. *Rigor mortis* usually occurs from five to six hours after death and begins in the jaw muscles. Stiffening of the muscles sometimes takes place within a very few minutes after electric shock. This rigidity should not be a sign to stop artificial respiration, as some persons in whom it has occurred have been revived.
8. Post-mortem staining. After death the arteries and left ventricle of the heart contract and empty themselves of blood. (The name "artery" comes from the Greek, meaning "to keep air," because early dissecters thought the arteries contained air only.) The blood accumulates in the veins and gravitates to parts not under pressure where the livid spots known as post-mortem staining appear.
9. Putrefaction. Decomposition of the body tissues starts in when *rigor mortis* passes off.

The body of a person who dies suddenly or is found dead under unexplained circumstances should not be disturbed until so ordered by the proper police authority.

DELIRIUM TREMENS. *See* Alcoholism.
DELPHINIUM SEEDS, POISONING. *See* Poison Table, Aconite, page 250.

DIABETES

Diabetes is a disease in which the body is not able to use or store all the sugar in food. The substance which normally enables the body to utilize sugar is insulin. Insulin is manufactured and poured into the blood stream by the pancreas, a large gland located below the stomach. The failure of the pancreas to produce enough insulin causes diabetes. That is why insulin prepared from the pancreas of certain animals is prescribed by physicians for diabetic patients. Insulin together with a careful regime of diet and exercise has made it possible for many diabetics to lead nearly normal lives.

There are now two kinds of insulin in common use—quick-acting or regular insulin, and slow-acting or protamine-zinc insulin. A person taking regular insulin must have an injection two or three times a day. A person taking protamine-zinc insulin usually needs only one injection a day.

I AM A DIABETIC

Name_____ Telephone No._____

Street_____ City_____

MY DIET: _____ C. _____ P. _____ F. INSULIN UNITS: _____ Regular or crystalline _____ Protamine

IF I AM FOUND ILL . . . and . . . if sugar, orange juice, or sweetened fluids do not cause definite improvement in 15 minutes,

PLEASE CALL Dr._____, whose telephone number is_____, or send me immediately to a hospital.

Condition	*Cause*	*Onset*		*Signs and Symptoms*		*What to Do*
Insulin Reaction	Too little sugar in the blood due to 1. Too much insulin. 2. Too little food or delay in eating after taking insulin. 3. Unusual exercise.	REGULAR INSULIN Usually within a few hours after taking.	PROTAMINE-ZINC INSULIN Usually many hours after taking.	REGULAR INSULIN Hunger, tremor, sweating, nervousness.	PROTAMINE-ZINC INSULIN Headache, nausea, drowsiness, a sick feeling.	Give sugar immediately Persons using protamine-zinc insulin may need sugar a second time. Diabetics taking insulin should always carry two lumps of sugar to be eaten in case symptoms of insulin reaction develop.
Diabetic Coma	Acid poisoning due to 1. Overeating or using up body tissue as in fever. 2. Insufficient insulin.	Gradual over a period of days.		A feeling of serious illness, often fever. Deep and difficult breathing. Nausea and vomiting. Severe pains in the abdomen. Drowsiness.		A diabetic who feels ill should 1. Send for a doctor. 2. Go to bed. 3. Drink a cupful of hot liquid every hour. 4. Keep warm. 5 Get a nurse or friend to give care. 6. Take an enema. If coma develops, treatment must be carried out by a physician.

INSULIN REACTION AND DIABETIC COMA

The two emergencies which may arise in diabetes are insulin reaction and diabetic coma. A person who is a diabetic should carry an identification card similar to the one illustrated (Figure 43), so that the proper measures can be taken if he is found ill. The first thing to do in that event is to give him sugar. orange juice, or sweetened fluids, and if no improvement is noted in fifteen minutes to call a doctor or send the diabetic to a hospital.

In the table on page 159 the cause, period of onset, early signs and symptoms, and first-aid care of insulin reaction and diabetic coma are compared.

DIGITALIS POISONING. *See* Poison Table, page 257.
DIPHENYLCHLORARSINE (a sneeze gas used in chemical warfare). *See* pages 341-342.

DISLOCATIONS

In a dislocation the bone at a joint is forced out of place. This cannot be done without tearing the ligaments and cartilage at the joint and damaging the blood vessels, tendons, nerves, and muscles in the neighborhood. The joints which allow a wide range of motion (the shoulder and hip joints) and those which are subject to strong muscular pulls or blows (the finger, thumb, toe, knee, jaw, and elbow joints) are the ones which are most frequently dislocated.

Amateur attempts to reduce (put back in place) dislocations are practically certain to result in further injury to the damaged tissues. For that reason the aid of a physician should be secured promptly for the proper treatment of a dislocation. The only ones which a layman may attempt to

reduce in an emergency are those of the fingers, toes, the (upper) joints of the thumb and big toe, and the lower jaw.

Cause. Dislocations usually are caused by a blow or a fall. Strenuous lifting or pulling which places a violent strain on the joints involved sometimes forces a bone out of place.

Signs and Symptoms. There is pain, which is often intense, and marked rapid swelling. The joint has a misshapen appearance, the change in shape always occurring at the joint and not in the course of the bone above or below it. Motion is limited or completely lost. There may be numbness due to pressure on nerves, particularly in the arm when a shoulder is dislocated.

What to Do. Have the victim lie down and keep him quiet and warm to prevent or minimize shock. Support the injured part in a comfortable position with a pillow or a folded coat or blanket. Apply cloths wrung out in very cold water to relieve the pain and to contract the blood vessels, thus reducing swelling.

If it is necessary to move someone whose hip is dislocated, place a support under the knee of the injured leg. In moving a person with a dislocated elbow or shoulder, use an arm sling as a support. Adjust the sling so that it does not exert an upward pull.

FINGER OR TOE, REDUCING A DISLOCATION OF

Face the victim and with the thumb and forefinger of one hand grasp the injured finger firmly on each side of the dislocation. With your other hand pull the end of the injured finger straight toward you. At the same time gently press on the dislocated joint until the bone slips into place. If you do not succeed in reducing the dislocation after one attempt, get medical aid at once.

Do not try to reduce a dislocation of the second joint of the thumb (the joint nearest the wrist). This must be done by a physician.

JAW, REDUCING A DISLOCATION OF

Signs. The lower jaw sags down and the victim is unable to close his mouth.

What to Do. Place the victim in a chair. Wrap your thumbs in several thicknesses of cloth to protect them from the victim's teeth. Face the victim and place your covered thumbs on his lower teeth, well back on each side, and with your fingers grasp his jaw under the chin (Figure 44).

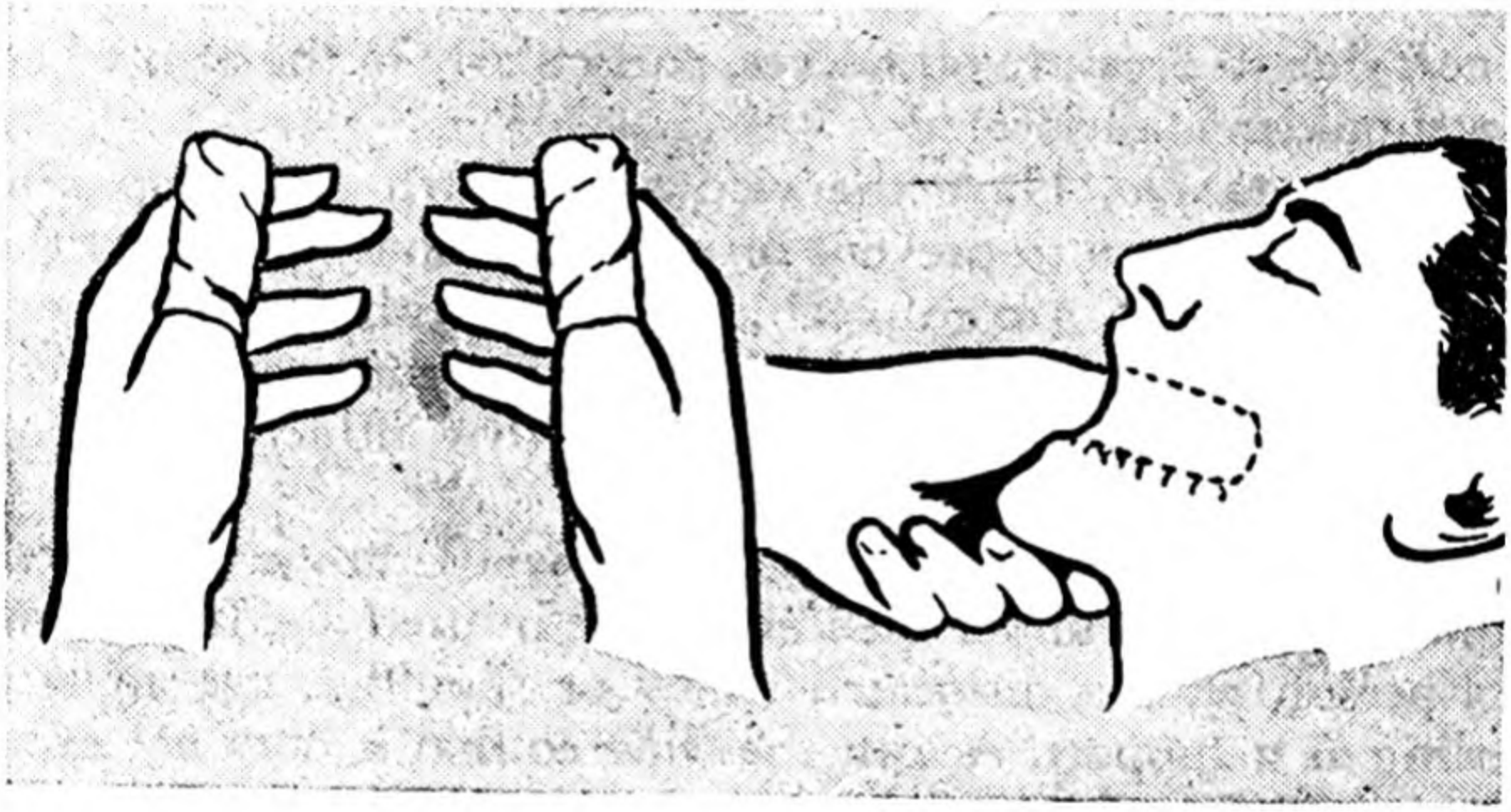


Figure 44

Press first downward and then backward with your thumbs and pull upward under the jaw with your fingers. As the jaw starts to slide into place, slip your thumbs off the teeth toward the inside of the cheeks so that they will not be caught between the teeth when the jaws click together. Then apply a four-tail bandage as shown on page 118, Figure 25.

DOG BITE. *See* Dog Bite *under* Bites, Animal.
DRESSINGS, WOUND. *See* Wounds, First Aid, page 317. *See also* First-aid Dressings, pages 20-25, and Bandaging.

DROWNING

Submersion as in drowning is a cause of asphyxia. Human beings are not equipped to extract oxygen from water as fishes are, and therefore their oxygen supply is completely cut off when they are under water. There is only enough oxygen in the air cells of the lungs, blood, and other tissues to last for a very short while. This amount varies in different individuals. Ordinarily it is exhausted after a complete submersion lasting five minutes, and death ensues. However, some people have been submerged for as long as twenty or thirty minutes and have been revived afterward by artificial respiration.

The amount of water drawn into the lungs during submersion also varies in different individuals. The first-aid worker need not concern himself with the question as to how much water has been inhaled, since his job is to start artificial respiration at once. The exertion of pressure on the chest walls, which forces the diaphragm up, serves the double duty of expelling water as well as air if there is water in the air passages. Water will flow out freely, provided there is no obstruction in the upper windpipe, throat, or mouth. To keep water from running back into the lungs when the pressure is removed, the head of the victim should be slightly lower than his body with his face turned to one side and resting on the hand and fingers.

Rescue. The majority of drowning accidents occur close to shore. If the drowning person is in deep water within arm's length of shore, lie flat with your upper body extended over the water and give him a hand. If the victim is beyond hand reach, take a firm grip on something on shore and with your body in the water fully extend your legs for him to grasp. If there is a stretch of shallow water between the shore and the victim, wade out to where you can grasp the victim and place him on his feet or pull him to shore. Brace yourself to keep from being pulled into the water.

In case a drowning person is out of reach of anything extended from the shore, throw him a rope or ring buoy if one is available. When the victim has a firm hand-hold, haul him to safety fast enough to keep his head above water but not so fast as to jerk the rope or buoy out of his hands. If no rope or ring buoy is available and the victim cannot reach an object while you hold the other end, launch toward him any available buoyant support such as a plank, log, paddle, or oar, so that he can use it as a temporary support until other measures can be taken to get him to shore.

A rowboat is the best means of rescuing a person who is beyond the reach of life lines or ring buoys. The only requirement for the rescuer is that he have some skill in rowing and maneuvering a boat. To keep from capsizing the boat, the best place from which to get the drowning person on board is the stern.

The swimming rescue is used as a last resort by persons skilled in lifesaving. It is employed only when there is literally no time to launch a boat, or when no boat or other rescue apparatus is available. The act of effecting a swimming rescue must be learned and practiced under expert supervision. Many double drownings occur every year because swimmers heroically but futilely attempt rescues beyond their strength and ability. If you are not a particularly good swimmer, do not attempt a swimming rescue. A novice rescuer may, if necessary, swim a plank or other buoyant object ahead of him, let the victim grab the other end, and then swim back to shore pulling the victim behind him.

The Life-Saving Service of the American Red Cross provides instructors for teaching lifesaving in the water. If a Red Cross lifesaving course is offered in your community and you are already a good swimmer, it will pay you to take it both for the improvement of your swimming technique and for the satisfaction of knowing that you are prepared to act quickly and efficiently in a drowning emergency.

Generally speaking, anyone who attempts to save life by swimming to the rescue should be guided by the following common-sense rules:

Approach a drowning person from the rear, whenever possible, to avoid any chance of being gripped so that you cannot swim.

If the drowning person is hysterical and struggling violently, swim a little distance away from him and wait until he exhausts himself or becomes calm on seeing help at hand.

Do not strike a drowning person to knock him out. It seldom works and only increases his fright.

What to Do After Rescue. After rescue the victim of submersion is usually in a state of collapse from fear and exhaustion. He may or may not be breathing. *If he is breathing,* do not allow him to walk or even to stand unsupported. Make him lie down with the head lower than the feet and swathe him in blankets, coats, or similar articles. Protect him underneath as well as above. If he is cold or the environment is cold provide external heat, if possible, (hot-water bottles, hot bricks or stones, or chemical heating pads). Give him a hot, stimulating drink if he can swallow without difficulty. Do not let him get up until a physician says it is safe for him to do so.

If he is not breathing, start artificial respiration at once (see Artificial Respiration, pages 67-70). While doing so, direct others who may be present to carry out the following orders:

1. Get help. Call a physician or a hospital ambulance service, telling what has happened and where. Then call the nearest police or fire department for an oxygen-carbon dioxide inhalator (see page 71).
2. Examine the victim's mouth and throat for possible obstructions to breathing, such as chewing gum or false teeth.

3. Take steps to get the patient warm and keep him so.

When expert help arrives, do not stop giving artificial respiration until you are relieved by someone competent to take over without losing the rhythm of respiration you have established.

DRUNKENNESS. *See* Alcoholism.

E

EAR, FOREIGN BODY IN

Any small, solid object lodged in the narrow winding canal which leads from the outer ear to the eardrum is a foreign body in the ear.

Small children are the only ones "in their right minds" who are known deliberately to push small objects like buttons, beans, peas, beads, and seeds into their ears. Adults experience "having something in the ear" when an insect flies or crawls in or when the wax secreted by glands in the skin lining the ear canal gathers into a hard ball and plugs the canal.

Signs. A child usually will contess the details of his ear-plugging experiment when he begins to get a painful or uncomfortable reaction. Frequently it is possible to see the foreign body by pulling the ear lobe down and out and looking into the opening. An insect usually advertises its presence in the ear canal by its buzzing. If a plug of hard wax is obstructing the canal, hearing is often impaired and the ear feels dull and full.

What to Do. The removal of a foreign body or a plug of wax from the ear canal can be done safely only by a physician. Do not poke into the canal with a hairpin, toothpick, or match in an effort to get it out. Not only may you push the object further in, but also you may scratch the lining

of the ear canal and thereby prepare the ground for an infection.

The buzzing of an insect in the ear canal may be silenced by drowning the insect with a drop or so of olive oil or mineral oil. Evacuating the insect's body is best left to the physician.

EARACHE

Earache usually is caused by an infection in the middle ear. The middle ear is the chamber, not much bigger than a pea, across which sound waves are carried by a chain of three tiny bones extending from the eardrum to the inner ear. The middle ear is connected with the throat near the throat opening of the nose by a tube called the Eustachian tube. This tube allows air to enter the middle ear in order to equalize the air pressure on both sides of the eardrum so that the drum can vibrate. Unfortunately, germs from the nose and throat also may gain access to the middle ear via the Eustachian tube. Forcible blowing of the nose when one has a cold is one of the principal ways in which infected mucus may be driven into the middle ear from the nose or throat. The forcing of infected water up the nose and thence into the Eustachian tube in swimming and diving is another.

Signs and Symptoms. Acute infection of the middle ear causes severe earache and in most cases results in the formation of a middle-ear abscess *(otitis media). Otitis media* is usually accompanied by fever which may be quite high, especially in children. The pus in the abscess is under considerable pressure and breaks through the eardrum unless a physician anticipates nature by lancing the drum. The chief danger of middle-ear abscess is that the infection may spread to the mastoid bone behind the ear, which has a small connection with the cavity of the middle ear.

What to Do. Always consult a physician. If the ear starts to ache in the middle of the night, or delay in consulting a

physician is unavoidable for some other reason, the pain may be relieved temporarily by applying an ice bag or a hot-water bottle to the aching ear. A cold application is more helpful than a hot one in most cases. A few drops of warm glycerin dropped into the ear also may help to relieve the pain temporarily.

The spontaneous breaking of the eardrum usually gives a dramatic release from pain, especially in children. However, this occurrence is not a signal that nature may safely be entrusted to handle the situation from then on. Heavy scarring of the eardrum which interferes with hearing, a chronic "running ear," or mastoiditis may be the penalty for neglecting to place a person with a draining ear abscess under a physician's care.

ELBOW, BANDAGE FOR. *See* Bandaging, page 110.
FRACTURE OF. *See* Fractures, Elbow, page 192.

ELECTRIC SHOCK

Electric shock occurs when an electric current takes a short cut from a conductor of electricity through a person's body to the earth. A conductor is anything through which electricity can pass, such as iron, steel, copper, water, and the human body. In electric shock the conductor may be an electrically charged ("live") wire or rail or faulty electrical equipment. Lightning also causes electric shock. When a person is struck by lightning, his own body acts as the conductor.

Signs. The victim of electric shock suddenly loses consciousness and ceases to breathe. He usually turns blue, but sometimes becomes very white. His pulse is weak or absent. Burns may be observed at the point of contact with the conductor. The body may become stiff, owing to the action of the electricity. This stiffness must not be mistaken for the rigor of death *(rigor mortis),* and hope of revival by artificial respiration must not be abandoned.

Stoppage of breathing is due to the paralyzing effect of the electric current on the breathing center at the base of the brain. If the shock has not been too severe and artificial respiration is started without delay, the breathing center usually recovers after a time and resumes the sending of impulses which activate the breathing muscles. In some cases the paralysis has lasted for as long as eight hours before it wore off and the victim started breathing naturally.

Rescue. Contact must be broken between the victim and the live wire or other electrical conductor. If the accident occurs at home, turn off the current at the switch. Do not touch the victim until you have done so, as the current will immediately pass from his body through yours.

If the accident occurs out-of-doors or in a building where you are not familiar with the switches, have someone telephone the electric-power company to turn off the current, and proceed at once with great caution to remove the victim from the conductor or the conductor from the victim. In doing this you must insulate yourself from the earth and from the victim in contact with the conductor by making use of good nonconductors such as wood, paper, cloth, leather, and rubber. Under no circumstances use any article that is damp or anything made of metal or with metal on it, such as a coat with a metal zipper or a belt with a metal buckle. Water and most metals are good conductors of electricity.

To insulate yourself from the earth, stand on a folded dry coat, a pile of dry newspapers or books, or a dry board, or some other nonconductor. To insulate yourself from the victim, wrap your hand in several thicknesses of dry cloth or newspaper or other dry, nonconducting material. Then grasp a dry part of the victim's clothing and drag him away from the conductor. Use only the insulated hand, keeping the other behind your back. Another way of breaking contact with a live wire is to use a dry pole or dry plank to push or pull the wire away from the victim. If the victim is lying

on a live electric wire or rail, he may be pushed off with a dry stick or plank or pulled off by means of a crooked stick, a loop of dry rope, an automobile tire or inner tube, or a handkerchief caught around his neck, arm, or leg.

After contact with the conductor has been broken, there is no danger in touching the victim. A person struck by lightning may be touched at once, since the electric charge has been expended in the ground.

What to Do After Rescue. Summon a physician but start artificial respiration at once. Continue until the victim is breathing naturally or the physician pronounces him dead.

After the victim has revived, give first aid for burns (see Burns), and for the prevention of shock (see Shock, pages 95-98.

EPILEPTIC FITS

Epilepsy, or "falling sickness," is a nervous disorder, the cause of which is unknown. Its victims are subject to recurrent convulsive attacks, commonly called "fits." An epileptic is likely to have a fit at any time. Frequently, he has an aura of warning so that he has time to sit down or lie down in a safe place. These premonitory symptoms may include a feeling of unusual depression or exhilaration, a marked change in facial expression, pain in the limbs or stomach, trembling, or the impression that air is blowing on some part of the body and passing upward toward the head. Persons familiar with an epileptic have no difficulty in recognizing an attack for what it is. If the victim is among strangers, he is sometimes mishandled or allowed to inflict self-damage that might be avoided by prompt action. A person subject to epileptic seizures should carry an identification card noting that fact.

Signs of an Epileptic Seizure. At the beginning of an attack the victim becomes very pale, cries out or screams, and, if standing, falls unconscious. He may strike the

ground or floor with terrific force. His body becomes stiff, and his arms, legs, and head move in violent spasmodic jerks, or convulsions. He ceases to breathe for the moment, rapidly becoming blue or purple in the face, and often froths at the mouth. The convulsive stage usually lasts for only a few minutes or less and is followed by a return of breathing and of normal color. During the second stage the victim rolls his eyes back and forth and clamps his teeth shut. He may bite his tongue or cheeks with the result that the froth at his mouth becomes bloodstained. Urination and a bowel movement may occur involuntarily.

This stage lasts for several minutes, after which the victim may slowly regain consciousness or fall into a deep sleep resembling unconsciousness. If seen first during the stage of quiet unconsciousness, and there were no witnesses to the attack, it may be difficult to recognize the unconsciousness as the aftermath of an epileptic seizure. Bloody froth on the lips, bitten lips or tongue, and disarranged clothing may give some indication of an epileptic fit as the preceding occurrence.

What to Do. Do not attempt to restrain the movements of the victim but keep him from injuring himself. If he is in a precarious position at the beginning of the seizure—for example, near a stove, open fire, or low-silled open window, or in or near deep water—act quickly—if possible, before he falls—to get him out of danger.

Remove from his mouth anything on which he might choke, for example, chewing gum, tobacco, or false teeth. Place between his teeth a wad of cloth or a piece of wood, such as a lead pencil, wrapped in cloth, to keep him from biting or chewing his tongue. Place something soft under him—for example, a folded coat, blanket, pillows, or a mattress—to prevent self-injury during the convulsions. After the fit, when he is unconscious or asleep, cover him with a coat or blanket. Keep the crowd away and wait

quietly until he awakens. Carry him if he must be moved. *Do not give stimulants*. Do not give artificial respiration during the blue stage.

An epileptic fit in itself is seldom fatal unless one fit succeeds another in rapid order. The danger lies in injuries that may be sustained in falling or in thrashing about during the convulsive stage.

EXPLOSIONS, EYES WOUNDED BY. *See* Eye, Wounds of.
LUNGS COLLAPSED BY. *See* page 326.
EXTREMITIES (Arms and Legs), BANDAGES FOR. *See* Bandaging, pages 107-116.
BLEEDING FROM. *See* pages 133-135.
FRACTURES OF. *See* pages 190-208.

EYE ACCIDENTS

The eyes set well back in their bony sockets and ringed with the promontories of the cheekbones, nose, and forehead are as well protected as they can be and yet perform their function of focusing light waves on the light-sensitive film called the retina, at the back of the eyeball. Eyebrows to catch perspiration, eyelashes to entangle dirt, tears to bathe the front surface of the eyeball with a mildly antiseptic solution, and eyelids equipped with nerves and muscles which act with hair-trigger promptitude when a flying object or an oncoming blow threatens the eyes are other means by which the body guards its most delicate and least secluded organs.

In spite of these precautions, the eyes because of their vulnerable position are especially susceptible to accidental injury. The injuries peculiar to the eyes are those caused by foreign bodies such as particles of dirt, sand, cinders, coal, emery dust, fine pieces of metal, and sawdust which are frequently blown into the eye and lodge there. Also, the eye, like other parts of the body, may be bruised by blows from blunt objects; wounded by forcible contact with sharp

objects, such as a stick, scissors points, or a lead pencil; burned by chemicals or explosives; and infected by germs.

EYE, BRUISES OF

An eye bruise is commonly called a black eye. The tissues surrounding the eye become swollen and painful and turn first red and then black and blue. Apply cloths wrung out of cold water to relieve the pain and swelling. A severe eye bruise should have medical attention.

EYE, CHEMICALS IN

If a chemical such as battery fluid, lye, or particles of lime, plaster cement, or caustic soda should fly into the eye, immediately irrigate the eye *then and there* with large quantities of clean water. Have the victim lie down. Hold his eyelids open and pour clean water from a clean pitcher into the inner corner letting it run out of the outer corner. Make sure that the water actually flows across the eye. After irrigation drop several drops of sterile olive oil or mineral oil into the injured eye, and send or take the victim to a physician at once. If there has been any delay in giving first aid, do not use water but get medical aid at once.

EYE, FOREIGN BODIES IN

Signs. Almost everyone has at one time or other had "something in the eye." Usually the impact of the particle on the eyeball is felt, and discomfort, blurred vision, and an increased flow of tears quickly follow. Sometimes, however, the presence of a particle imbedded on the eyeball is not made known until inflammation of the eye sets in.

What to Do. Instruct the victim not to rub the eye, as rubbing may cause the particle to scratch the eyeball and lids or to become imbedded in the tissues. Have him close his eyes and give the increased flow of tears a chance to dislodge and flush out the particle. If this does not work, use

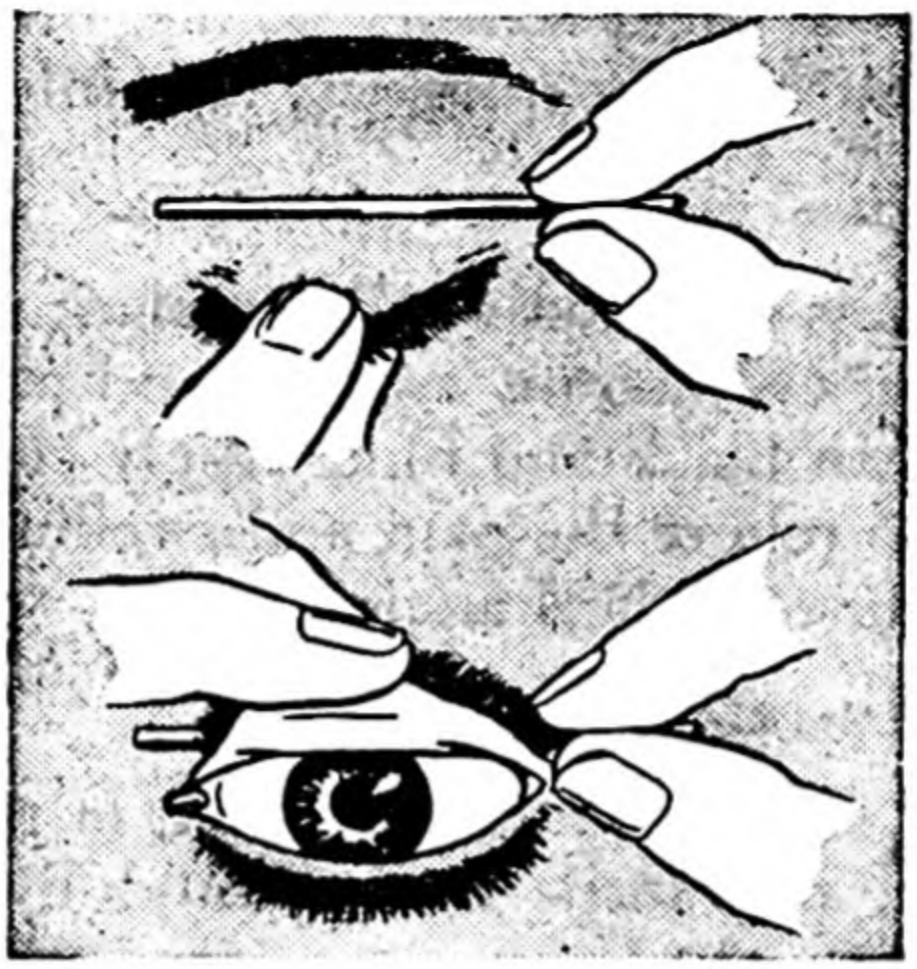


Figure 45

the first method described below, and if that fails the second, and so on.

1. Using a sterile medicine dropper, flush the eye with boric-acid solution (one scant teaspoonful of boric acid to one glassful of sterile water). If this method fails or the means of using it are not available—

2. Grasp the lashes of the upper lid and pull the upper lid down over the lower. Hold the upper lid in this position for several seconds. Then examine the inside corner of the eye to see whether the particle has been wiped into view. If so, remove it by touching it gently with the corner of a piece of sterile gauze, a freshly laundered handkerchief, or sterile cotton wound tightly on a wooden applicator. If not—

3. Try to locate the particle by looking under the lids. Examine the lower lid first. Have the person face a good light. Place your thumb or finger directly beneath the lower lid and press downward while the person looks *up*. If you spot the particle, remove it in the manner described above.

To examine the upper part of the eyeball and the lining of

the upper lid, grasp the upper eyelashes between the thumb and forefinger of one hand and pull the lid down and out. Then place a finger of your other hand, a pencil, or a wooden match stick, on the lid about half an inch from its outer edge and quickly turn the lid up and back (Figure 45). It requires practice to do this skillfully. Look for the particle while the person looks downward. If you see it, remove it in the manner described in method 2. A few drops of sterile oil dropped into the eye after a speck has been removed is soothing.

4. If the foreign body is imbedded in the eyeball or the eyelid, or there is any difficulty in removing it, put two or three drops of sterile oil in the eye, place a sterile compress moistened with cold water over it, and get the person to a physician as quickly as possible.

EYE, INFECTIONS OF

Cause. Eye infections are caused by germs of various kinds which gain access to the eyes in the process of rubbing them with contaminated fingers, or of washing them with, or swimming in, contaminated water, or of wiping them with contaminated handkerchiefs, washcloths, towels, and similar articles. Also infection may follow a wound inflicted by a foreign body, a sharp instrument, or an explosive.

Signs. The beginning signs of an eye infection are the classic signs of inflammation—heat, swelling, redness, and pain—plus an excess flow of tears (watering of the eyes), which is nature's way of dealing with an invasion of the eye. Later large quantities of pus may be discharged, as in the case of acute contagious conjunctivitis (pink eye).

What to Do. Consult a physician at the appearance of the first signs. The layman has no way of knowing whether the inflammation is due to eyestrain, a comparatively minor infection, or a very serious one which may result in blindness. In caring for an infected eye under the doctor's direction, remember that most eye infections are extremely con-

tagious. A person with an infected eye must not touch his eyes; all materials used for dressings must be burned or disinfected after removal; and all instruments and utensils used in eye irrigations must be sterilized by boiling before and after use.

EYE LOTIONS, BELLADONNA, POISONING FROM. *See* Poison Table, *under* Atropine, page 253.

EYE, WOUNDS OF

If the eye is wounded by a foreign body like a splinter of wood, glass, or metal, or as the result of falling on, running into, or being hit by an object, an explosion of chemicals or fireworks, or in a shooting accident, cover both eyes with a sterile compress, bandage it lightly in place, and consult a physician at once.

F

FAINTING

Fainting, or syncope, is loss of consciousness due to lessening of the blood supply to the brain.

Cause. Some of the common causes of fainting are want of food, fatigue, pain, prolonged standing, exposure to an overheated room, and emotional shock, such as fright or joy. Some people faint at the sight of blood or as a consequence of even a trivial injury. In giving first aid it is not uncommon for the victim to faint during treatment or even before treatment has been started. It sometimes happens that the fall, if the injured person has been standing, causes more harm than does the original injury.

Signs. A person about to faint complains of feeling dizzy and weak. He gets paler and paler and perspiration usually breaks out on his forehead. He may say that "everything looks black." In fainting he slumps into a chair or falls to the floor unconscious. His breathing is shallow, and his pulse weak and slow.

What to Do. If you notice that a person is about to faint, make him sit down and thrust his head forward between his knees. This has the effect of improving the circulation of blood to the brain. If the person does not improve, or actually faints, lay him flat on his back and lower his head by elevating the lower part of his body. This may be done by placing a pillow, folded coat, or blanket under his hips. Loosen tight clothing about his neck and waist. Cover him warmly and see that he gets plenty of fresh, moving air. Open a window or fan him. Wave smelling salts or a handkerchief wet with a few drops of aromatic spirits of ammonia under his nose every minute or so. Sprinkle cold water on his face. Usually the victim revives in a very short time. After he regains consciousness, give him a stimulating drink such as half a teaspoonful of aromatic spirits of ammonia in water or hot coffee or hot tea. Make him lie still for a while.

One type of heart attack characterized by pallor and a weak pulse greatly resembles fainting (see Heart Attack). If a fainting attack lasts for more than a few minutes, keep the victim covered warmly and summon a physician at once.

FEVER

By fever is meant an abnormal condition of the body characterized by an increase in temperature above normal, an increased pulse rate, an increased rate of breathing, and various other signs and symptoms, such as thirst, weakness, apathy, or delirium.

The exact cause of fever is unknown. It represents some interference with the heat-regulating mechanism of the body resulting in increased heat loss, increased heat production, or both.

In an infection, fever accompanies the chemical reactions which take place as the body manufactures substances to kill bacteria or neutralize their poisons. There is an in-

creased breakdown of body tissue, as the action of toxins or poisons on the body cells speeds up oxidation. It is believed that fever and the conditions that accompany it are protective reactions to overcome the effect of toxins on the body. In any event, it is a demand on the part of the body for co-operation, a signal to take to bed and call a doctor so that the defense forces of the body can function under the best conditions possible.

FINGER, BANDAGE FOR. *See* Bandaging, pages 115-116.
DISLOCATION OF. *See under* Dislocations.
FRACTURE OF. *See* Fractures, Finger, page 194.
FINGERNAIL, SPLINTER UNDER. *See under* Splinters.

FIRE EXTINGUISHING

In Buildings

If you discover a fire in a building, give the alarm promptly either by telephone or by fire-alarm box. Shut all windows, doors, and transoms to prevent drafts which fan the flames and, if the blaze is small, try to put it out. It has been said that the first five minutes of fire fighting are worth more than the next five hours in controlling the spread of fire.

If water is used, attack the burning substance rather than the flames. Throw the water on a little at a time at the base of the fire and drench the surrounding material. *Water must not be used* to put out a fire in electrical equipment, because it is a conductor of electricity, nor in any inflammable liquid such as grease, oil, or gasoline, because it will scatter the burning liquid over a wider area.

If water is not available or the fire is in a motor, electrical equipment, or an inflammable liquid, try to put out the blaze by smothering it. Throwing a blanket, rug, earth, ashes, sand or a similar substance on a fire cuts off the supply of oxygen without which a fire cannot burn. Beating the fire with a broom, coat, blanket, or towel is another form of smothering.

The chemicals in fire extinguishers quench fires by cutting off the oxygen supply. On the label of the fire extinguisher are listed the kinds of fires which the contents of the extinguisher will put out.

In Clothing

If your clothing catches fire do not run or remain standing. The thing to do is to wrap yourself in a rug, blanket, coat or some other article made of heavy material, lie down, and roll over and over. Protect your face with your arms. If there is nothing within reach to wrap yourself in, lie down and roll over and over. If necessary, beat out the flames with your hands.

To extinguish fire in another person's clothing, first make the person lie down. If he starts to run, throw him down forcibly by tripping him. Then, starting with his shoulders, wrap him in a rug, coat, or blanket.

Of Incendiaries Used in Warfare. See Appendix, pages 350-354.

FIRE, RESCUE FROM

Escape from Burning Building

If you are caught in a burning building, use great caution in opening doors leading into hallways or stairways. A burst of hot air from a suddenly opened doorway may mean instant death. Touch the door before opening it, and if it feels hot seek another exit. If the door is not hot, turn away your face and open it slightly. If flame or smoke is near by, close the door and look for some other way of escape.

In a building filled with smoke, the purest air is nearest the floor. Cover your nose and mouth with a damp cloth or handkerchief and crawl along the floor, using the wall as a guide. The damp cloth filters out some of the fumes and lessens the danger of inhaling flame, *but it does not act as a gas mask to prevent carbon-monoxide poisoning.*

If every other avenue of escape is cut off, go to a window but *do not jump* unless the distance to the ground is not great. If no one sees you and comes to the rescue with a ladder or fire net, make a rope by tying firmly together strips torn from sheets, blankets, or articles of clothing. Tie the improvised rope to a heavy piece of furniture, such as a bed, and slide to safety.

Rescue of Person from Burning Building

In rescuing someone who has been overcome by smoke or gas in a burning building, the simplest method is to get hold of his arm or clothing and drag him after you as you crawl along the floor. In going downstairs, crawl feet-first. The fireman's drag described under Transportation of the Injured (Figure 110, page 304) is another excellent method of rescue.

After rescue give the victim first aid for burns, if necessary (see Burns). In case a victim overcome by smoke fumes or carbon monoxide has ceased breathing start artificial respiration at once. (See Artificial Respiration, pages 67-70.)

FISHOOKS, REMOVAL OF

Whenever possible, a fishhook caught or embedded in the flesh should be removed by a physician. Only when a physician cannot be reached for some time and the victim is willing and able to stand the pain of the operation should removal by a layman be attempted. A necessary implement is a wire cutter or clipper to cut off the barb of the hook. Unless the barb is cut off, the hook cannot be removed by pulling it out the way it went in without badly tearing the flesh.

What to Do. Work the fishhook onward and upward through the flesh and out, point first. Then cut off the barb with the wire cutter. Grasp the shank and work the hook out along the path by which it entered (Figure 46). Apply

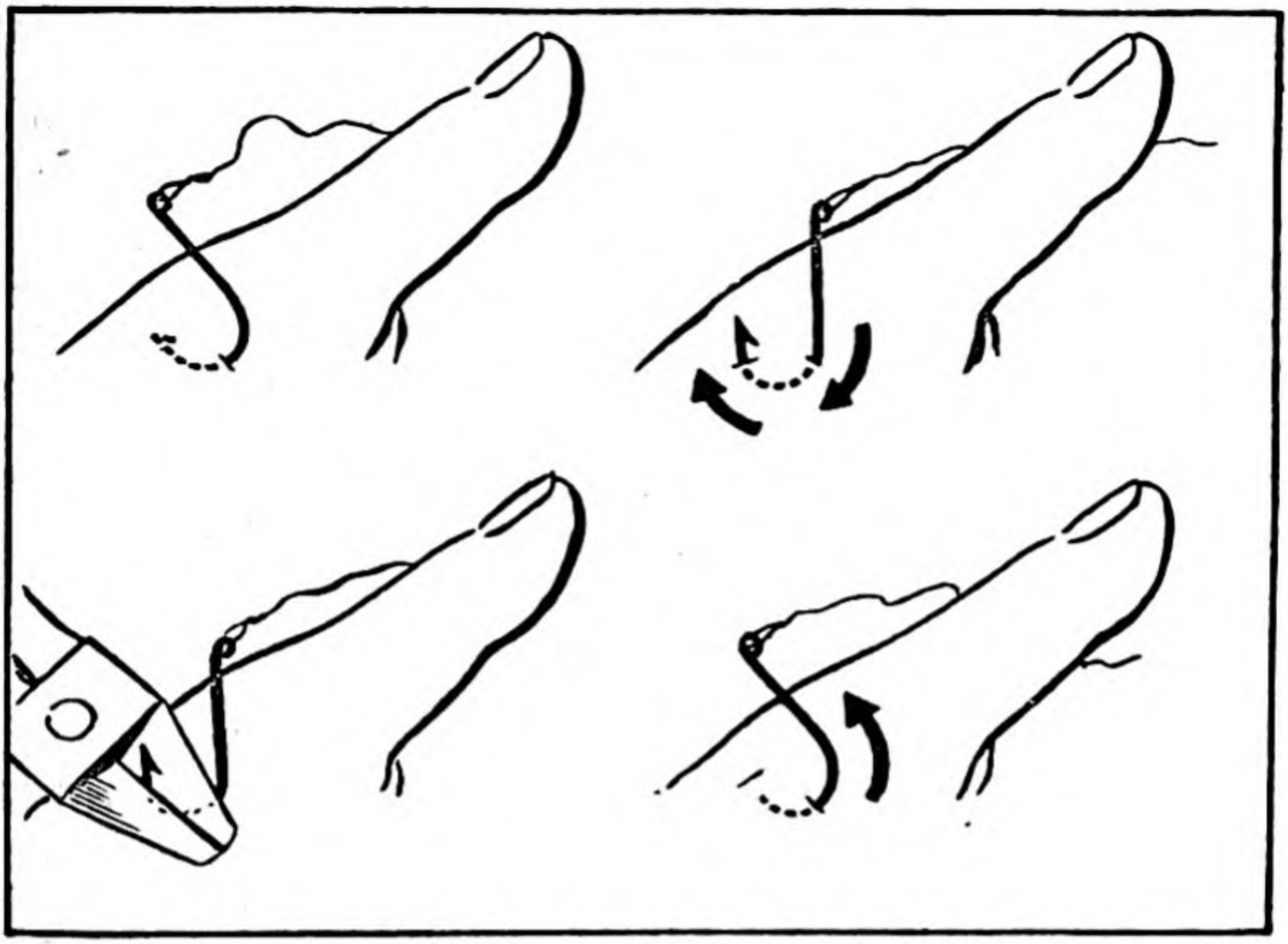


Figure 46

iodine with an applicator or cotton swab well down into both wounds, cover both with sterile compresses when the iodine dries, and get the victim to a physician as soon as possible.

A fishhook wound is a punctured and possibly a lacerated wound. As such it carries the danger of tetanus (see Tetanus); for that reason the physician may think it advisable to give the victim tetanus antitoxin. The sooner this is administered the better.

FIRST-AID SUPPLIES. *See* pages 19-42.
FITS, CHILDREN'S. *See* Convulsions, Infantile.
FITS, EPILEPTIC. *See* Epileptic Fits.
FLUORIDES, POISONING FROM. *See* Poison Table, page 257.
FLY POISON SWALLOWED. *See* Poison Table, Arsenic, page 252.

FOOD POISIONING

An acute gastrointestinal illness caused by eating food infected with bacteria or their poisonous products (toxins) or containing poisonous chemicals is, for want of a better term, described as food poisoning. It was once customary to refer to food poisoning as ptomaine poisoning. Ptomaines, which get their name from the Greek word for carcass, are deadly alkaloid poisons formed by the action of decomposition bacteria on proteins. Any animal food in an advanced enough stage of decay to harbor ptomaine-forming bacteria is seldom eaten. Ptomaine poisoning is thus an erroneous name for the great majority of cases of food poisoning.

Causes. Food poisoning by bacteria or their toxins usually is caused either by food infected with bacteria which multiply in the body after it has been eaten or by food in which toxin has developed through bacterial action before the food is eaten. Botulism, the most dangerous illness caused by bacterial toxin in food, is described below under the heading, Food Poisoning, Botulism.

The bacteria known to cause food poisoning usually come from the intestinal discharges of human beings. Among them are organisms belonging to the enteritis group and the paratyphoid group. Infected wounds, especially on the hands, and infected throats are other sources of bacteria which infect foods.

Food handlers who do not wash their hands thoroughly before handling food are mainly responsible for bacterial food poisoning. The foods which are most likely to contain living bacteria as a result of contamination by food handlers are those which are eaten raw (salads) or handled after cooking (cold meats, sandwich fillings, cream puff or cake fillings, ice cream), or made from leftovers which have not been cooked a second time. One often hears of mass food poisoning among those who have attended a picnic or church supper, or among children in a boarding school or

summer camp. Generally speaking, the occurrence of gastrointestinal illness at about the same time in a group of people who have all eaten the same food practically always means poisoning from infected food.

Food poisoning also may be caused by poisonous metallic or organic substances introduced into wholesome food by carelessness, accident, or malice aforethought. For example, arsenic, lead, tin, zinc, and copper may be introduced into foods from containers or from chemical action of the food on the container or for purposes of adulteration. Poisonous mushrooms and poisons sometimes found in foods ordinarily edible, such as certain species of fish, also may cause chemical food poisoning.

Signs and Symptoms. Gastrointestinal illness from food poisoning usually begins within a few hours after the infected food is eaten. The severity of the illness varies greatly. There may be only mild abdominal pain, diarrhea, and nausea, or severe colic with vomiting and prostration. If the attack is severe, the offending food is likely to be vomited quickly. The illness may last from a few hours to several days.

What to Do. Obtain medical help as quickly as possible. It is important to do this in all severe gastrointestinal upsets accompanied by pain, because of the necessity of getting a correct diagnosis as well as for the immediate relief of the victim. If it is known *beyond question* that the case is one of food poisoning, first aid consists in the speedy removal of the infected food. Induce vomiting and at the same time flush out the stomach by having the victim drink large quantities of lukewarm water to which salt or mustard has been added. When the water vomited is clear, give repeated small doses of saline laxative and copious enemas, if the physician has not yet arrived.

FOOD POISONING, BOTULISM

Botulism is a very serious type of food poisoning caused

by a toxin produced by a germ called *Clostridium botulinum*. There are at least four strains of this organism—Types A, B, C, and D. Antitoxins have been prepared from strains A and B (the only ones yet found in the United States) by injecting increasing amounts of the toxin into susceptible animals.

The germs responsible for botulism are widely distributed in spore (seed) form in the soil and on vegetation. They grow and produce their deadly poison only when they are sealed away from light and air and are provided with food, warmth, and moisture. These conditions are found in canned foods which were not heated thoroughly enough in the process of canning to kill the germs. The importance of sterilizing preserved foods is now so well understood by commercial packers that botulism from commercially canned or preserved foods has become exceedingly rare. Home-canned foods are now the chief source of botulism. It sometimes happens that several members of a family who have all eaten the offending food are stricken at about the same time.

Signs and Symptoms. Unlike the bacteria which cause ordinary food poisoning, the toxin manufactured by the botulinus bacillus does not produce irritation of the digestive tract. Rather it attacks the nervous system, with the result that nervous symptoms of brain origin characterize the disease. The symptoms usually appear in twenty-four hours after eating the offending food, but this period may be considerably shortened or lengthened according to the amount of toxin ingested.

Early symptoms are a general feeling of illness, fatigue, and muscular weakness, disturbances of vision, and possibly headache and dizziness. In severe cases nausea, vomiting, and diarrhea may occur as a nervous reaction to be followed by constipation due to paralysis of the intestinal muscles.

Later there may be difficulty in swallowing and talking.

The mouth and throat become dry and the breath offensive. There is a dry cough and a bitter taste in the mouth. In fatal cases death may occur in forty-eight hours after ingesting the poison, usually within four to eight days.

What to Do. There is nothing a layman can do except to recognize the early signs and symptoms and get a doctor at once. The treatment consists of administering the appropriate antitoxin as soon as botulism is suspected. Antitoxin also should be given to others who ate the same food, even if they show no symptoms of botulism. Since botulism toxin is a nerve poison, the antitoxin is of little use after the disease is well advanced.

FOREARM, BANDAGE FOR. *See* Bandaging, page 108.
CONTROL OF BLEEDING FROM. *See* Bleeding, page 134.
FRACTURE OF. *See under* FRACTURES, page 195, for traction-fixation splinting; page 191, for ordinary splints.
FOREIGN BODIES IN
EAR. *See* Ear, Foreign Bodies In.
EYE. *See* Eye, Foreign Bodies In.
FLESH. *See* Fishhooks, Removal Of; Splinters, Removal of.
NOSE. *See* Nose, Foreign Bodies In.
STOMACH. *See* Stomach, Foreign Bodies In.
THROAT OR WINDPIPE. *See* Choking.
FORMALDEHYDE POISONING. *See* Poison Table, page 257.
FORMALIN POISONING. *See* Poison Table, Formaldehyde, page 257.
FOWLER'S SOLUTION. *See* Poison Table, Arsenic, page 252.
FOXGLOVE POISONING. *See* Poison Table, Digitalis, page 257.

FRACTURES

A fracture is a break in a bone. Broken bone and fractured bone mean the same thing. There are, in general, two kinds of fracture: simple and compound. In a simple fracture the bone is broken but there is no wound extending from the ends of the broken bone out through the skin. In a com-

pound fracture, the bone is broken and in addition there is an external wound made either from the inside by the shattered end or ends of the broken bone or from the outside by the impact of whatever caused the fracture. The fracture may be comminuted. that is, small pieces of bone may be driven into the tissues.

Even slight movement by the victim of a simple fracture or careless handling by the person giving first aid may cause the splintered ends or sharp edges of the broken bone to pierce the tissues and skin from the inside, thus transforming the injury into a compound fracture. Also, damage to the surrounding nerves and blood vessels caused by the careless handling of a simple fracture may greatly increase pain and shock or cause serious complications.

Causes. Falling on or against a hard object, being hit by a rapidly moving object, and injuries caused by crushing are common causes of broken bones.

Signs and Symptoms of a Simple Fracture. Usually it is possible to tell whether a bone has been broken as the result of a fall or blow. The victim may feel or hear the bone snap. He complains of pain and tenderness in the region of the break, and the pain becomes more severe on pressure or attempts to move. Usually there is complete loss of function in fracture of the long bones. Swelling is moderate or severe and appears quickly. There may be deformity of the injured part caused by overlapping of the broken ends of the bone. In fracture of the limbs the broken limb may be shorter or look crooked when compared with its uninjured mate on the other side. This is well illustrated by the common wrist fracture known as Colles' fracture, in which the appearance of the hand and forearm is like that of a reversed silver fork.

Signs and Symptoms of a Compound Fracture. In addition to the indications of simple fracture, the point of the break communicates with the outside air through a hole in the skin. One or more fragments of the broken bone may

protrude through the flesh. There may be severe bleeding. Shock is practically always present.

What to Do in General. When in doubt, handle as a fracture any injury received as the result of a fall, blow, or crushing. In all cases of fracture or suspected fracture, send for a physician.

The objects of the first-aid care of simple fracture are *first,* to prevent further injury through careless handling—for example, to keep a simple fracture from becoming a compound fracture and to avoid damage to the spinal cord in the case of a broken spine or to the brain in case of skull fracture; *second,* to make the victim as comfortable as possible; *third,* to guard against the development of shock, by keeping the victim lying down, warm, and quiet.

What Not To Do

Do not let the victim move until you are sure that a change of position will not aggravate his injuries.

Do not transport the victim from the place of injury unless it is essential to do so.

Do not move a person with a fractured limb for even a short distance without first applying splints. Remember the slogan *"Splint 'em where they lie."*

Do not try to set a broken bone.

Examine with Care. If a doctor can be secured quickly, it will not be necessary to make an extensive examination in order to determine the exact site and extent of the injury unless there is bleeding. If it is impossible to get a doctor immediately or there is evidence of bleeding, carefully remove the clothing over the injured part by cutting or ripping the seams of outer clothing and cutting or tearing underclothing. In case of foot injury, cut the shoe laces and if necessary the shoe leather at the back and remove the shoe gently. The necessity for handling the injured person with extreme care cannot be overemphasized.

Severe bleeding is rarely present in a case of compound

fracture, but if it does occur the first thing to do is to check it. In most cases it may be controlled by covering the wound with a sterile compress held in place by a bandage. If this does not work, apply pressure with your fingers or hand at the nearest pressure point between the wound and the heart (see Bleeding, How to Stop It, pages 132-135). Cover the wound, after bleeding has been controlled, with a sterile gauze compress held in place by a bandage, as in the first-aid care of any wound.

Do not apply a tourniquet unless bandage pressure or digital pressure fails. If a tourniquet is applied, do not cover it with the bandages used in holding splints in place. Mark TK on the victim's forehead and the time at which the tourniquet was applied. See pages 79-83 for directions and the precautions to use in putting on a tourniquet. In case of compound fracture without severe bleeding, it is advisable to put a tourniquet loosely in place before applying splints, so that it can be tightened if severe bleeding starts.

Fractures, Splinting

Splints are used to immobilize the injured part when a bone is broken in the upper or lower limbs. Fixed traction in applying splints for fractures of the long bones of the extremities is now widely used in first aid. When properly applied early enough, fixed traction helps to draw the broken ends of the bone apart and lined up as nearly as possible in normal position. The broken ends of the bone are thus kept from being pulled one over the other (overriding) when the muscles attached to the bone contract. Fixed traction also relieves pain, thus making the development of shock less likely, and helps to prevent further damage to soft tissues in the neighborhood.

CAUTION: However, fixed traction may do more harm than good *unless applied by a physician or a trained first-aid worker*. In some localities the use of fixed traction, even by trained first-aid workers, is discouraged or prohibited.

Methods of applying fixed traction for fractures of the extremities are described on pages 195-198 and pages 205-208 *for reference use only*. Individuals who have not received special training under supervision in fixed-traction splinting and those who live in localities where fixed-traction splinting by laymen is prohibited must use ordinary methods of splinting fractures of the extremities as described on pages 190-195 and pages 199-204.

In Splinting a Fracture, remember that:

1. The splints must be rigid enough to prevent the churning about of the broken ends of the bone while the victim is being moved.
2. They must be long enough to fix the joints above and below the break and wide enough to extend slightly beyond the injured part on each side.
3. They should be thickly padded with soft material on the side to be applied next to the injured part in order to fill hollows and protect bony points.
4. They should be bandaged in place firmly and gently but not so tightly as to cut off circulation. (Since swelling may continue after the splints have been applied, a splinted part should be examined every half-hour and the splints loosened if they have become uncomfortably tight.)
5. A bandage must not be tied directly over the point of the fracture.

Splints may be fastened to the injured part by either one of the following methods:

I. Wrap each bandage twice around the limb over the splints and tie on the outside. A thin stick may be used to poke the bandage under the body or limb at a point where there is a natural arch. The bandage can then be gently worked up or down to the desired position.

II. Double the bandage lengthwise on itself. Place the

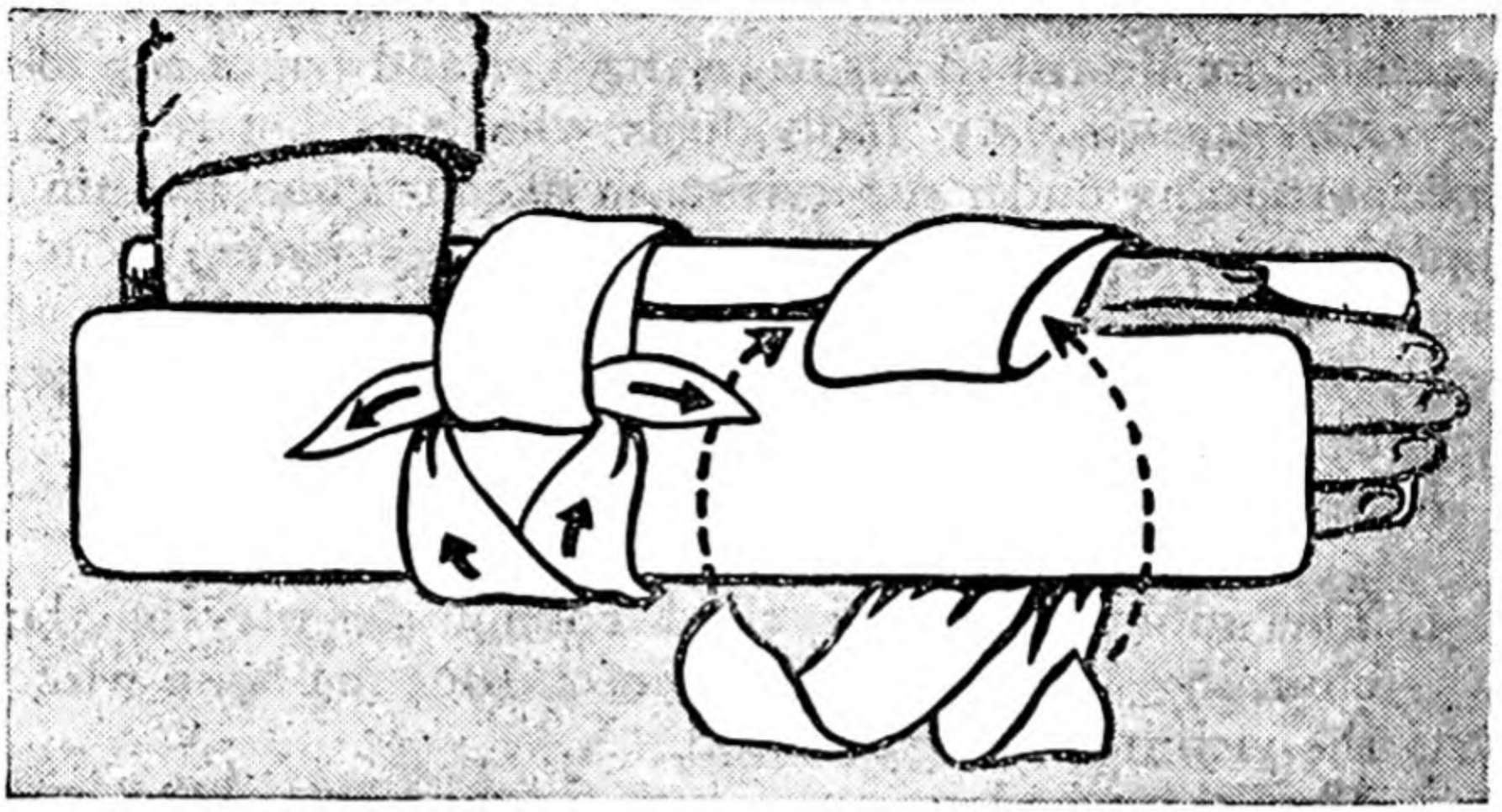


Figure 47

loop on the outside edge of the outer splint. Carry the ends inward around the limb (Figure 47). Pass both ends through the loop in opposite directions. To tighten the bandage, pull on the two ends and then tie over the outer splint with a square knot.

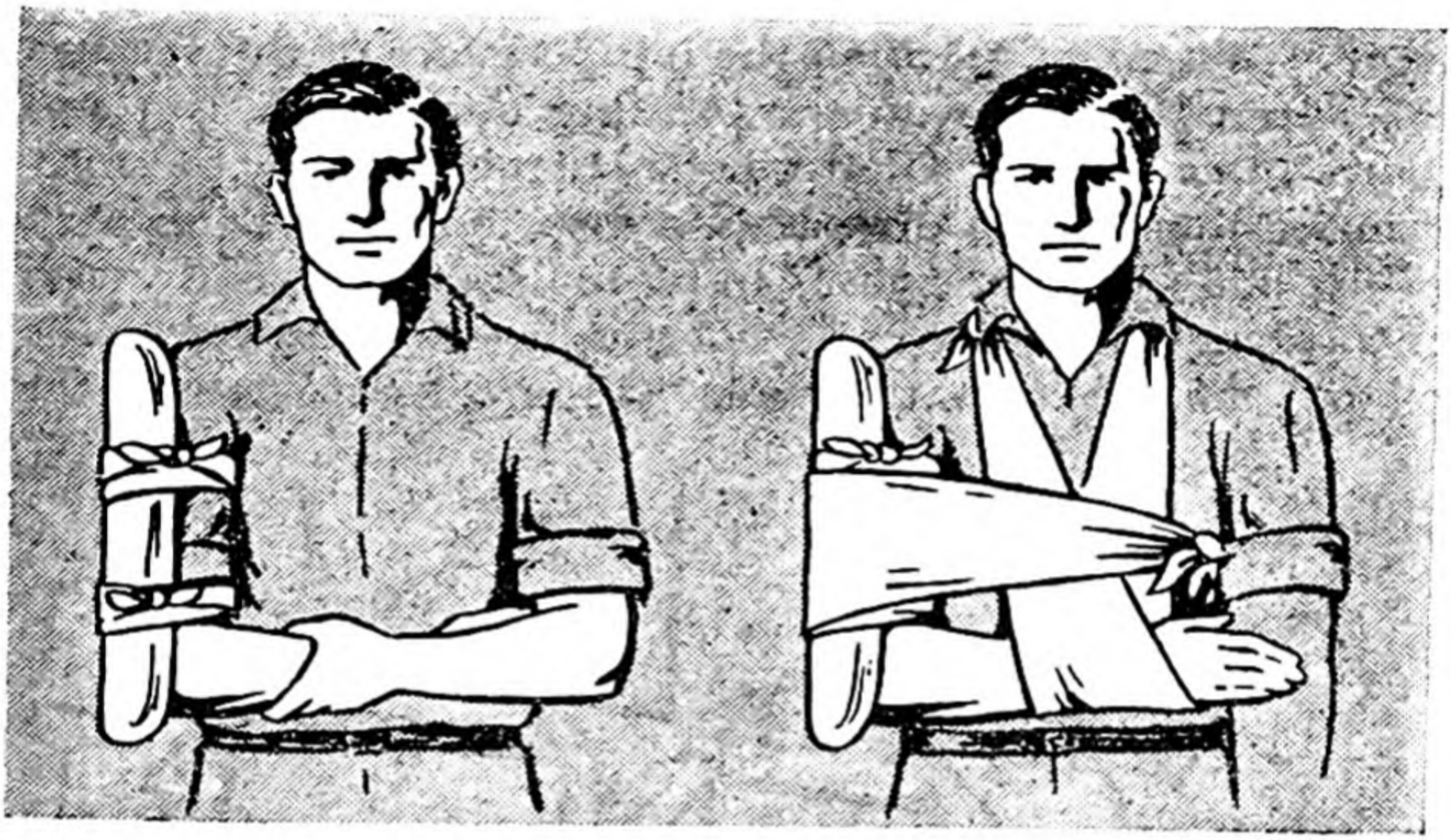
Fracture of Bones in the Upper Limbs

Splinting Without Fixed Traction

Arm, Upper. In a fracture of the upper arm, the bone extending from the elbow to the shoulder is broken. Pain, swelling, and deformity are present. The victim may or may not be able to move his arm.

What to Do. Gently place the arm in as natural a position as possible with the forearm bent at a right angle to it and lying across the chest, palm side in. Place one padded splint on the outside surface, extending a little below the elbow and a little above the shoulder. Fasten the splint in place with two cravat bandages, one above the point of fracture

and one below (Figure 48*a*). Then support the forearm with a cravat-bandage sling, and bandage the arm to the body with a triangular bandage, towel, or any large piece of cloth passed around the body over the sling and tied under the arm on the opposite side (Figure 48*b*).



a *b*

Figure 48

Forearm and Wrist. Fracture of the forearm means the breaking of either one or both of the bones leading from the wrist to the elbow. In fracture of the wrist, one or more of the small bones forming the wrist joint are broken.

If both bones of the forearm are broken, pain, swelling, and possibly deformity and inability to move the arm are present. If only one bone is broken, the victim may be able to move the arm. The unbroken bone acts in some measure as a splint for the broken bone. In Colles' fracture of the wrist, the forearm and wrist have the appearance of a reversed silver fork.

What to Do. Gently place the forearm across the chest at right angles with the upper arm. Take care not to cause motion at the site of the fracture. If an assistant is available, have him support the under part of the forearm on each side of the break as you bend the arm. Prepare two padded splints long enough to extend from above the elbow to the fingers. Place one splint on the inner surface of the victim's forearm and hand, with the padding next to the arm and palm. Place another splint on the outer surface of the forearm and hand, with the padding next to the arm and back of the hand. Tie the splints in place firmly but gently with two cravat bandages or strips of muslin—one just below the elbow, the other at the wrist (Figure 49). Support the

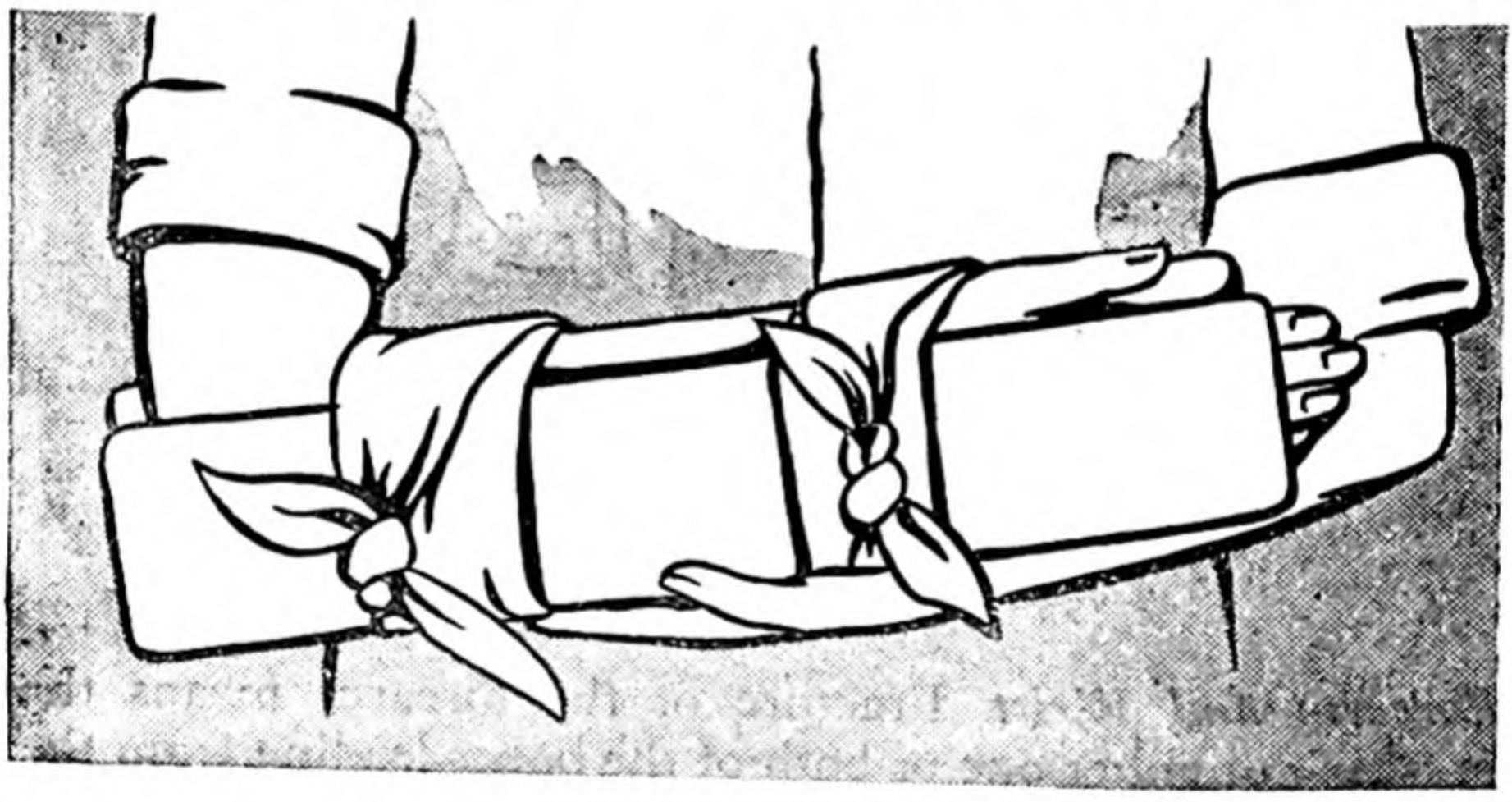


Figure 49

forearm with a triangular-bandage sling with the fingers a little higher than the elbow.

Elbow. In fracture of the elbow, severe swelling of the joint usually appears quickly.

What to Do. If the arm is straight, place a single padded splint on the inside of the arm, reaching from the palm

nearly to the armpit. Tie the splint in place with three cravat bandages, one above the elbow, one between the elbow and wrist, and one at the wrist (Figure 50).

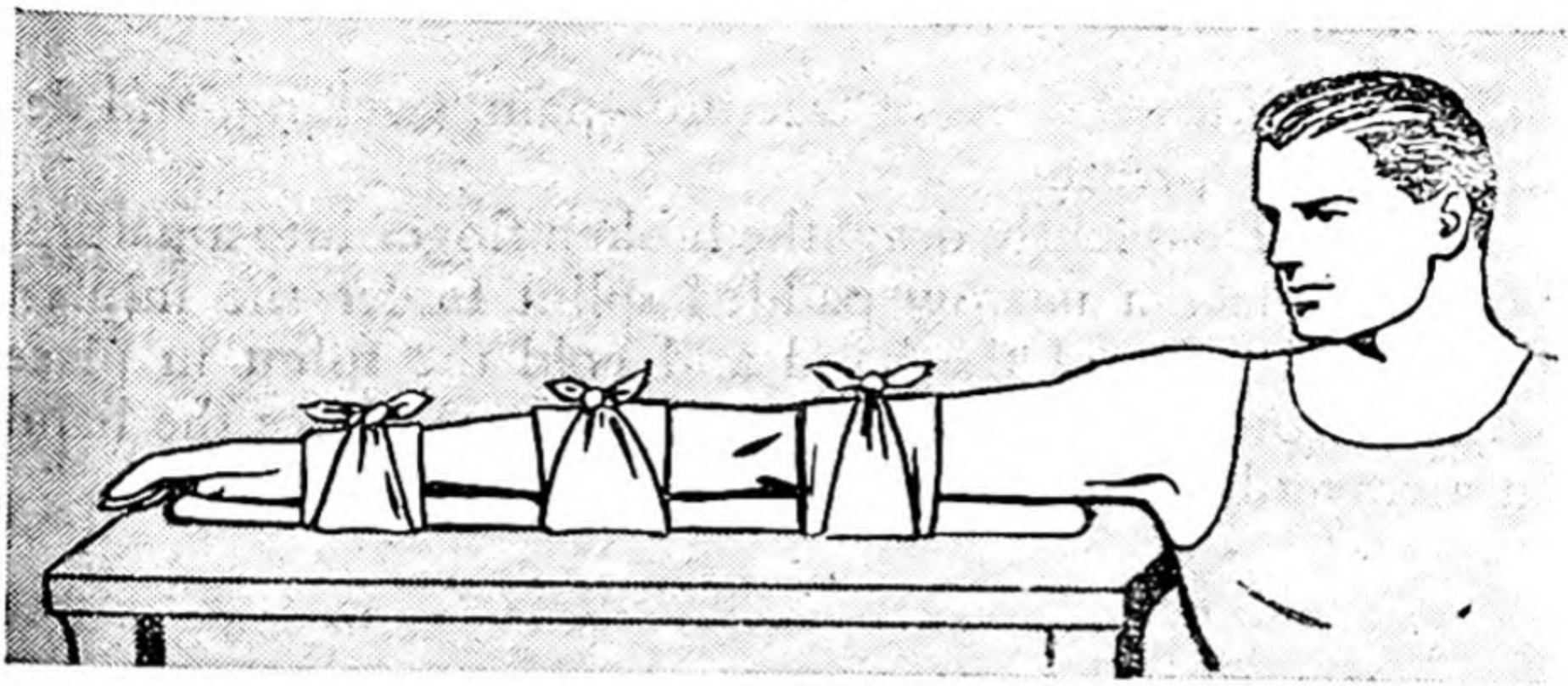


Figure 50

If the elbow is bent, *do not try to straighten it*. Carefully place the arm in a large triangular-bandage sling (Figure 51). Then tie the arm snugly to the body with a wide band-

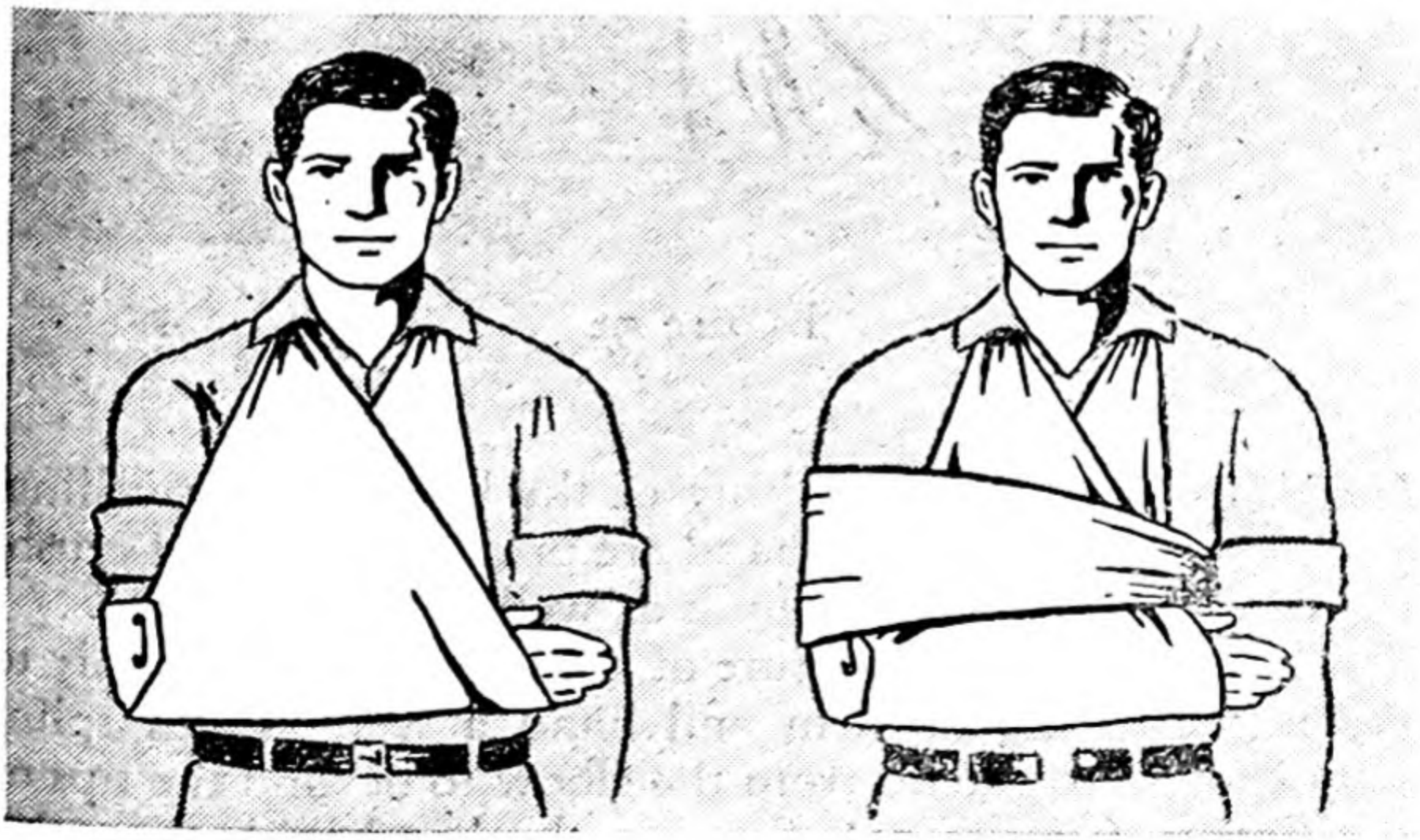


Figure 51

age passed completely around the body over the upper arm on the injured side and under the armpit on the uninjured side. Do not pull the bandage so tight as to cut off circulation in the injured arm.

Finger. The usual signs of fracture—pain, swelling, and deformity—are present.

What to Do. Gently draw the broken finger into a natural position. Place a narrow padded splint under the injured finger and palm of the hand and hold the splint in place with narrow strips of bandage (Figure 52). Place the hand in a cravat-bandage sling.

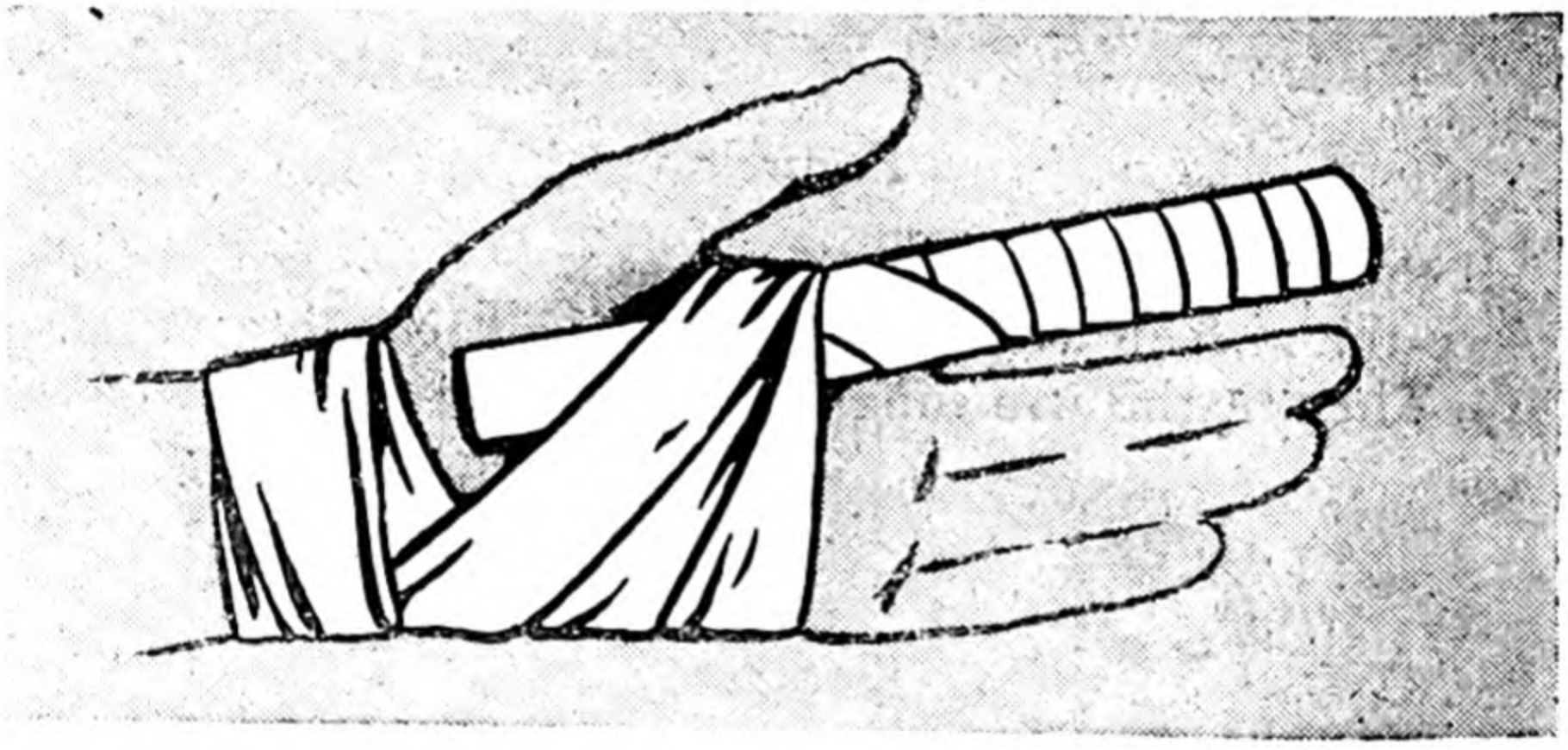


Figure 52

Hand. In fracture or crushing of the hand, pain, swelling, and loss of motion in the hand are present. In case of crushing there may be open wounds as well as broken bones.

What to Do. For a fracture of bones of the hand, apply to the inside of the forearm and hand a well-padded splint long enough to extend from the elbow to beyond the tips of the fingers (Figure 53). Support the hand with the palm down in a triangular-bandage sling.

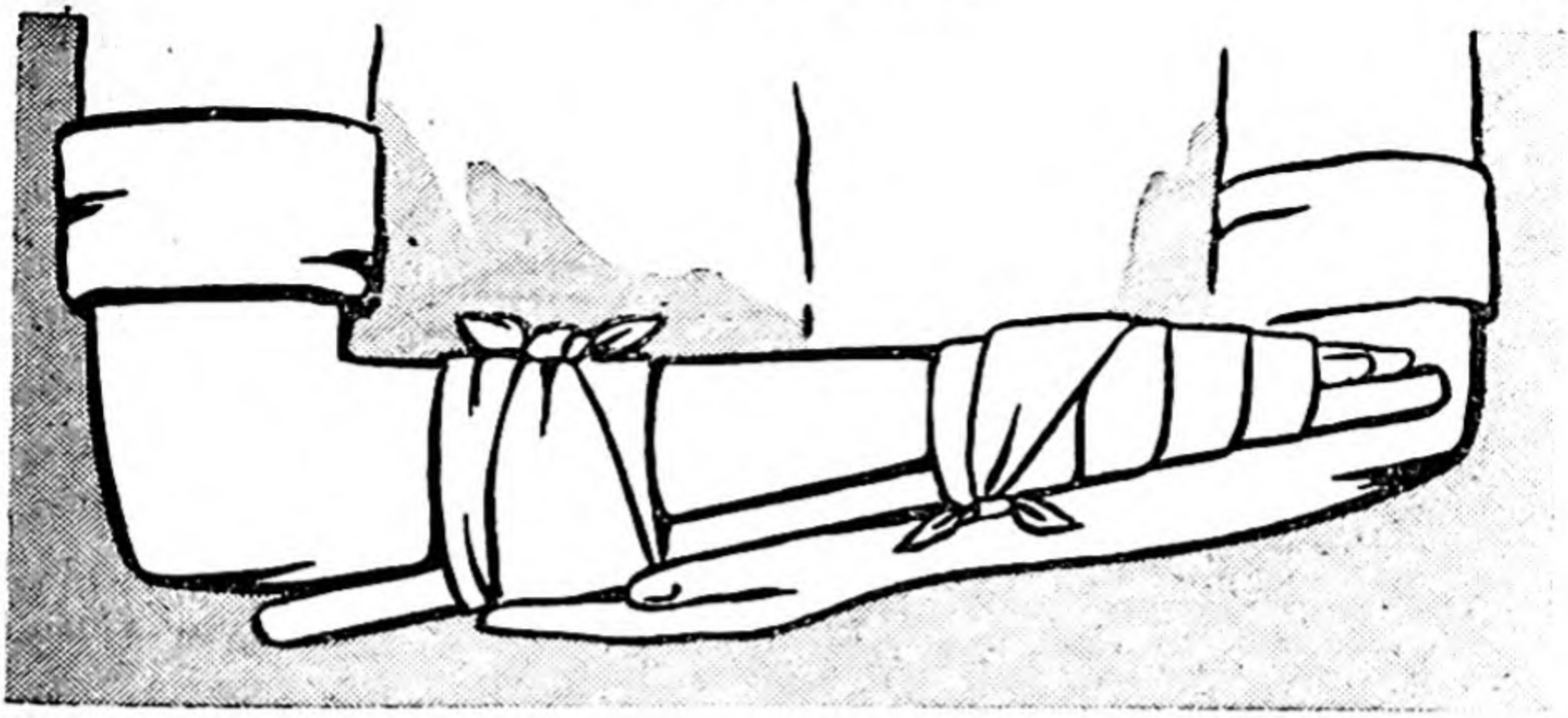


Figure 53

In case of compound fracture or other open wounds due to crushing, hold a sterile compress in place over the wound with a triangular bandage (see under Bandaging, Figure 19, page 113) before applying the splint.

Splinting with Fixed Traction*

Long Bones of the Arm. Splinting with fixed traction is used for any fracture between the shoulder and the middle of the forearm. Different types of splints for applying fixed traction have been devised and may be purchased from any surgical-supply house. If a prepared splint is not available, one may be improvised from a board four inches wide and long enough to reach a foot above the shoulder and a foot below the hand. Cut a wide V-shaped notch in each end.

Traction is made before the splint is applied. One person grasps the wrist and maintains a gentle, steady pull, at the same time straightening the arm to a position as nearly normal as possible (Figure 54). A second operator then applies the splint as follows:

* See the caution on page 188.

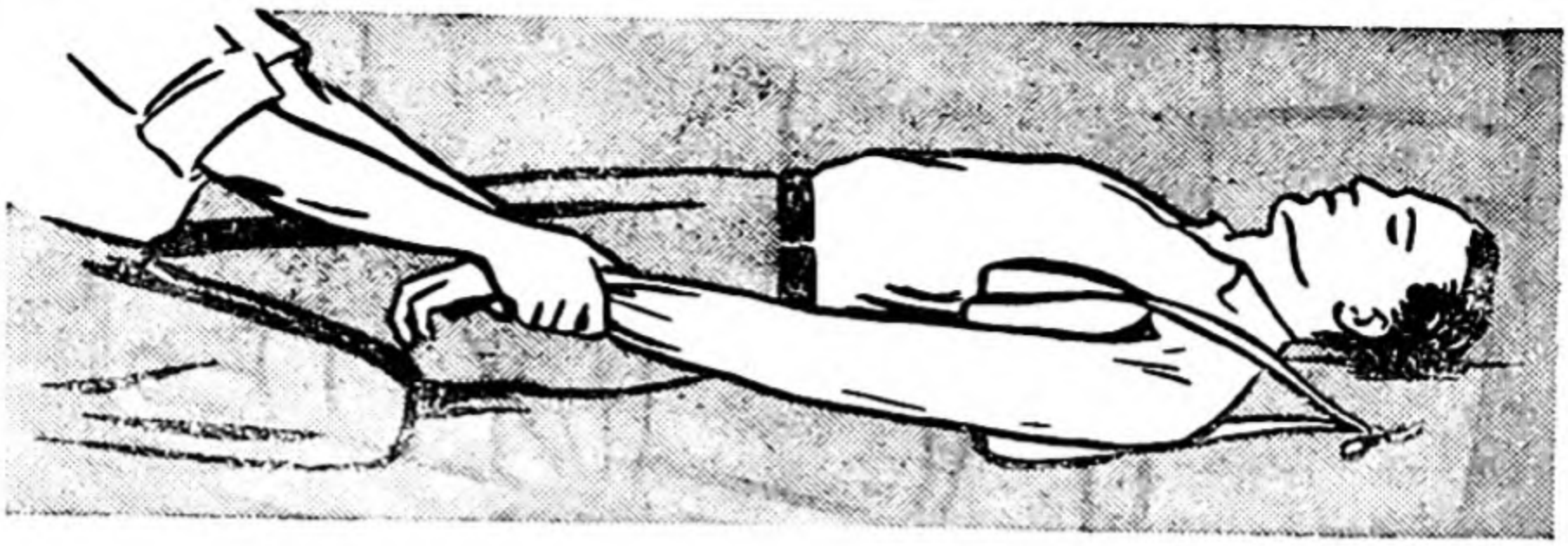


Figure 54

1. Tie a cravat bandage around the upper arm so that a loose loop is formed in the armpit, with the tied ends over the shoulder (Figure 54). The armpit must be well padded under the bandage loop with articles of clothing or a small pillow, to prevent shutting off circulation in the axillary artery.

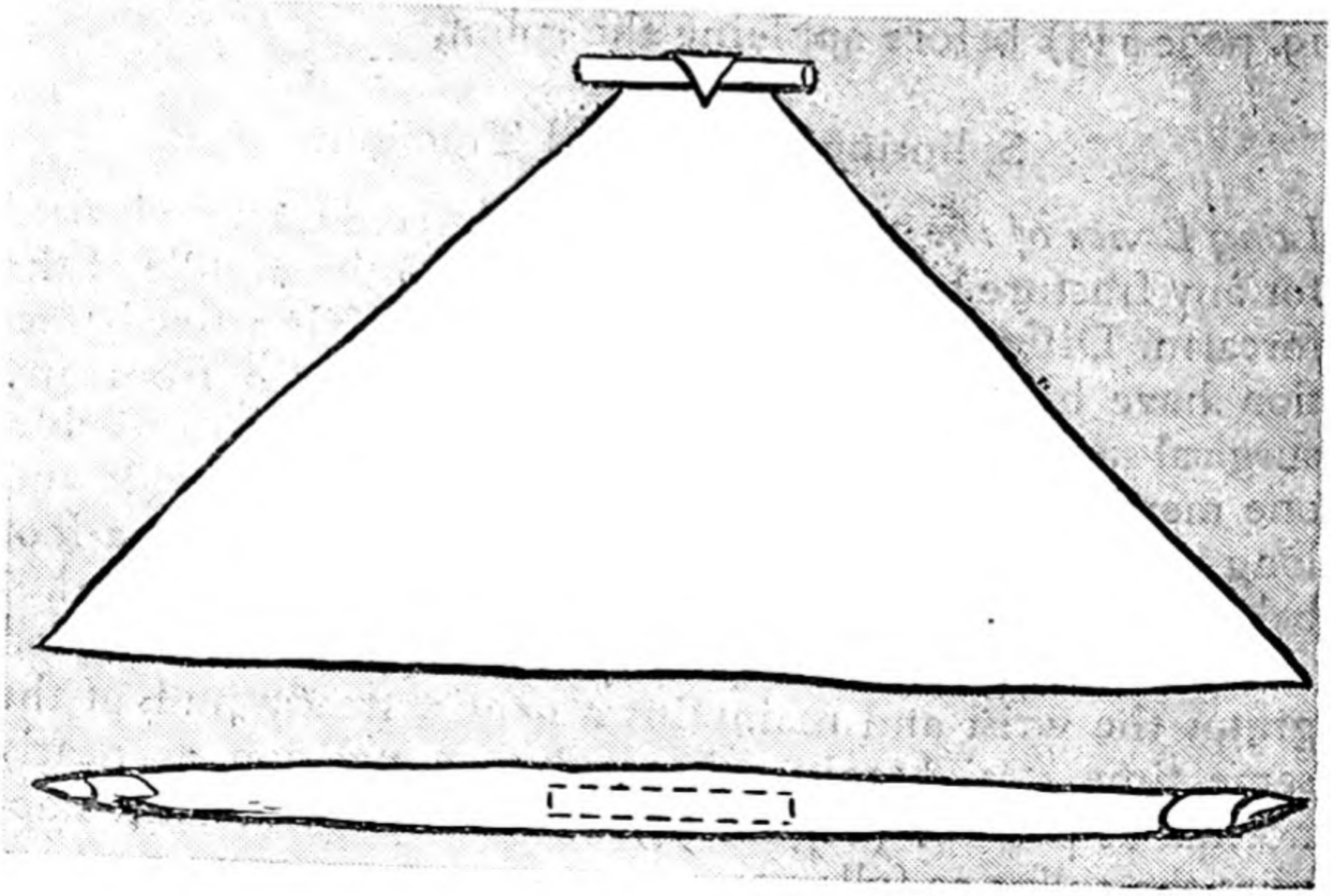


Figure 55

2. Apply a traction hitch to the hand as follows: Lay a four-inch-long stick at the apex of a triangular bandage and roll it in the bandage so that a long tail hangs from each end of the stick (Figure 55). Place the wrapped stick across the victim's palm and fold his fingers over it so that the bandage tails hang down on each side of the fist to form the traction bands. Then wrap a cravat bandage around the fist, to keep the fingers from opening, as follows: Place the center of a cravat bandage on the back of the wrist, pass the ends completely around the wrist and cross on the back of the hand. Then pass the ends over the fist and carry them to the underside of the wrist, pull them tight, cross, bring them to the back of the wrist, and tie (Figure 56).

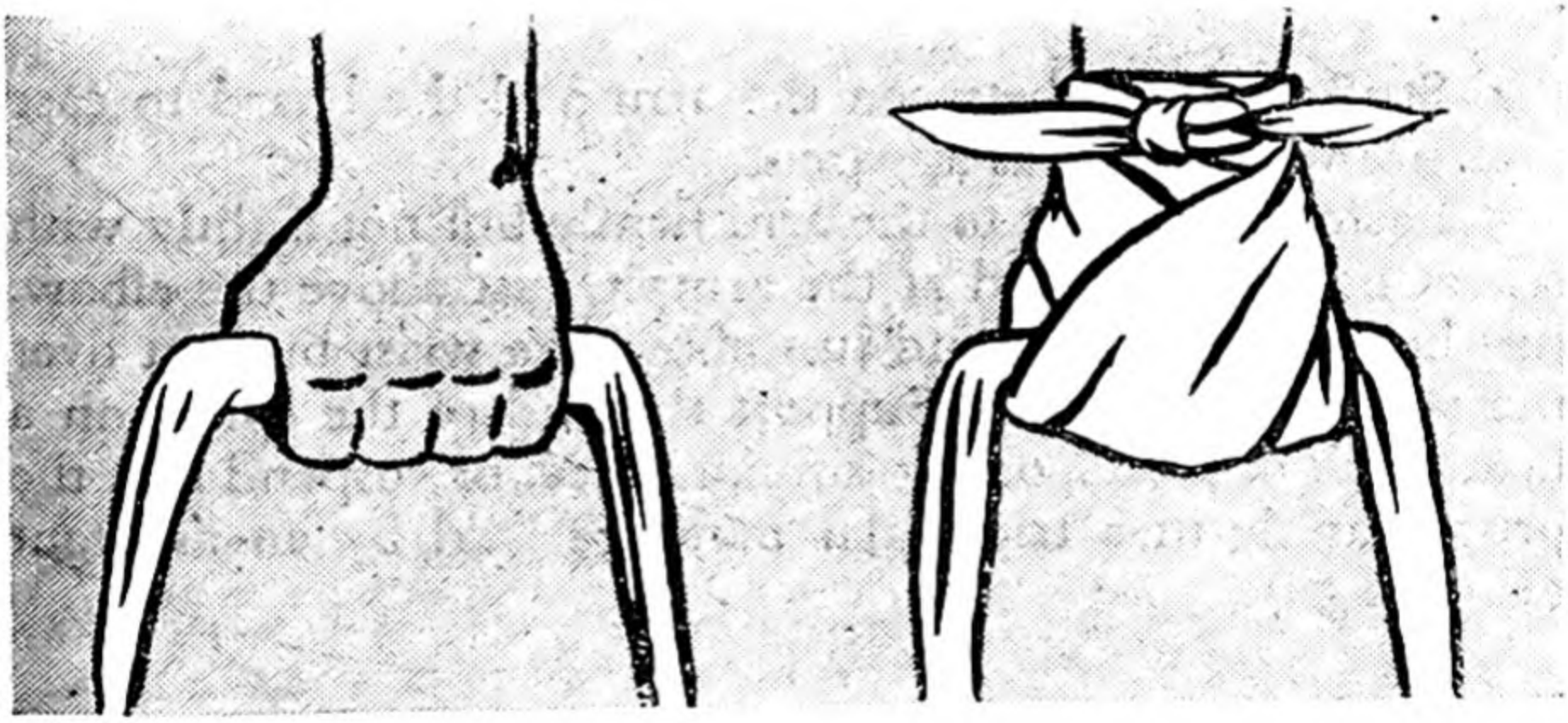


Figure 56

3. Insert the notch in the upper end of the splint into the loop at the armpit, with the board against the outer surface of the arm and back of the hand. Tie firmly so that the loop will not slip out of the notch. Draw the traction bands from the hand snugly down under the notch at the lower end of the splint. Slip the ends up over the notch, and wrap around the end of the board in opposite directions and tie firmly. Insert a short, stout stick between the traction bands below

the fist and, engaging both bands, twist to take up the slack and exert enough pull to maintain traction (Figure 57).

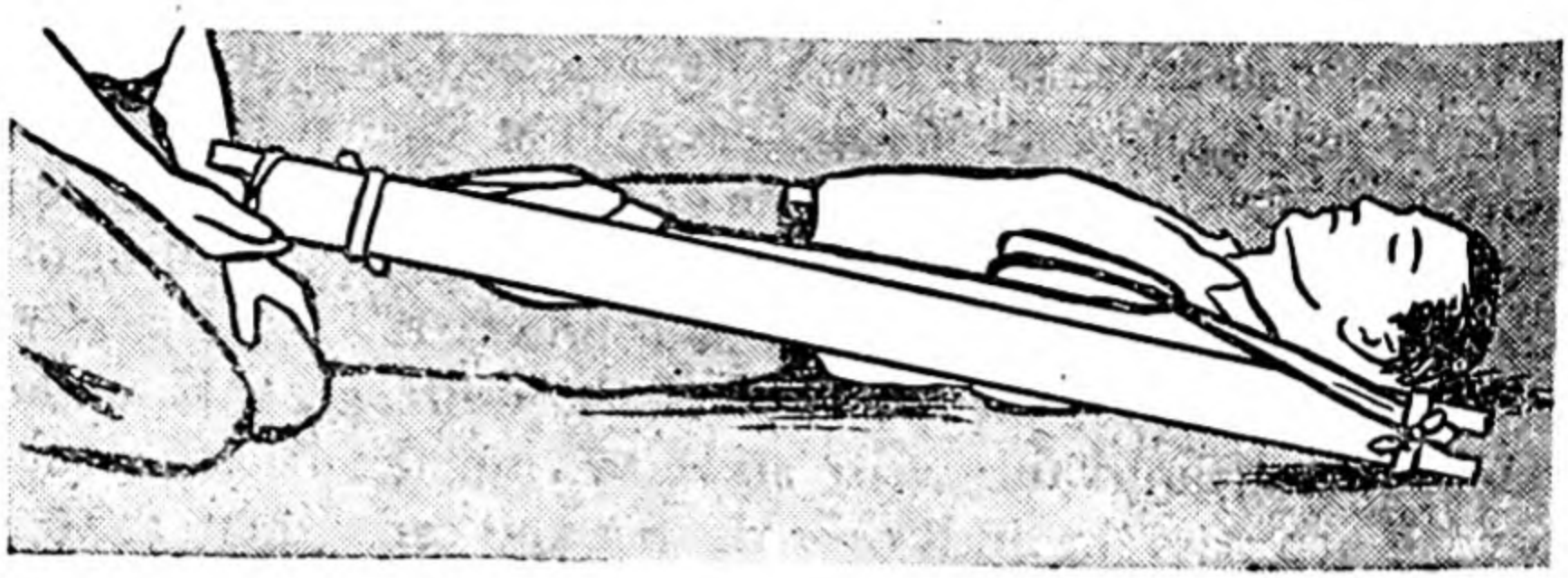


Figure 57

4. Stuff padding between the arm and the board to ease pressure wherever it is apparent.

5. Fasten the splint to the arm firmly but not tightly with cravat bandages placed at the armpit, just above the elbow, just below the elbow, and just above the wrist but not over the point of the break. Support the end of the splint on a box, block of wood, or any similar object or suspend it at the proper angle in a triangular bandage held by an assistant (Figure 58).

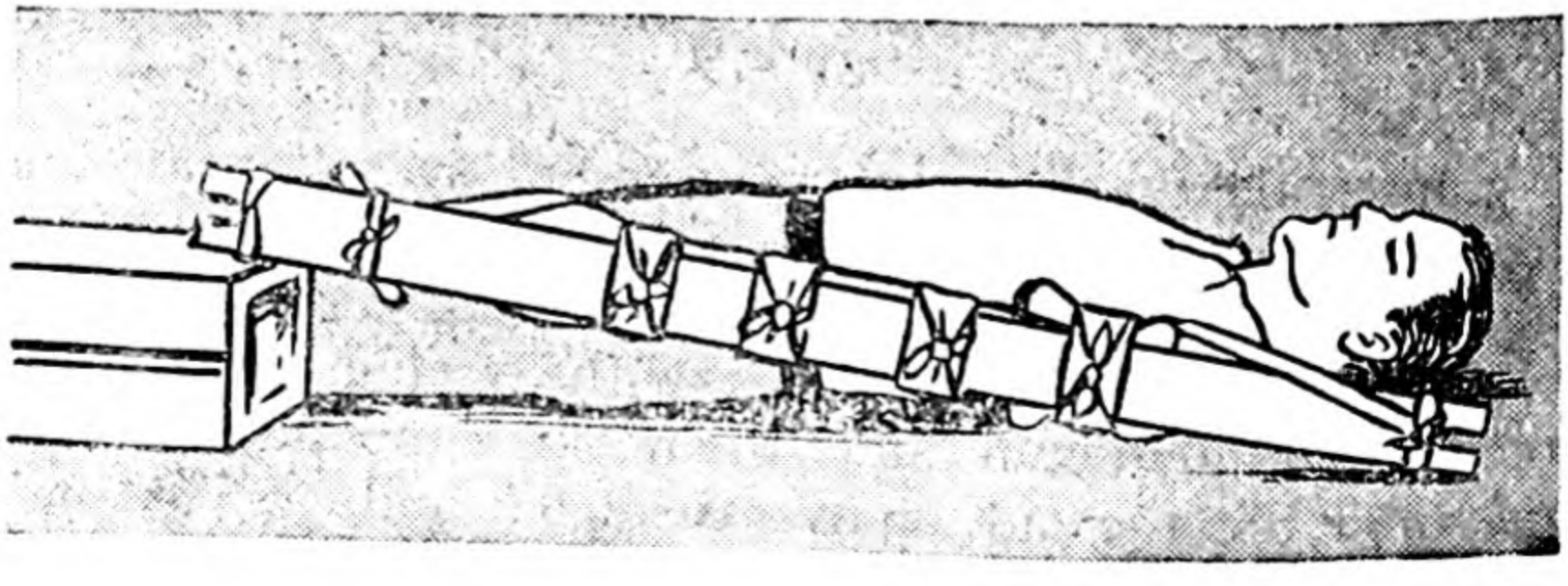


Figure 58

FRACTURE OF BONES IN THE LOWER LIMBS

Splinting Without Fixed Traction

Leg and Ankle. Fracture of the leg means a break in one or both of the long bones leading from the knee to the ankle. In fracture of the ankle, one or both of the lower ends of the two long bones are broken.

If both bones are broken, pain, swelling, deformity, and loss of function are likely to be present. If only one bone is broken, there may be no noticeable deformity or loss of function, as the other bone acts as a splint. Since a break just above the ankle joint may be mistaken for a sprain, any injury to the lower part of the leg which might cause fracture should be handled as a fracture until an X-ray picture can be taken.

What to Do. Straighten the leg by grasping the foot firmly with both hands and pulling slowly and steadily, while rotating the foot to a normal position (see Figure 67*a*, page 205). Use great care, for the leg bones are very near the skin and a simple fracture may easily be converted into a compound one. Maintain the pull or traction, on the leg, while an assistant is preparing the necessary materials for splinting. When working alone tie both feet together after the injured leg has been placed in a normal position, until you are ready to apply the splints. Either a pillow splint or board splints may be used.

To apply a pillow splint, raise the leg (while maintaining traction) just high enough to place under it a firm pillow or a folded blanket. Tie the pillow or blanket firmly around the limb in five places (Figure 59). Then place a stick or board on each side of the leg outside the pillow or blanket.

If board splints are used, the splints must be well padded and long enough to extend from above the knee to below the heel. Place one splint on each side of the leg and fasten them firmly in place with five cravat bandages or strips of muslin (Figure 60).

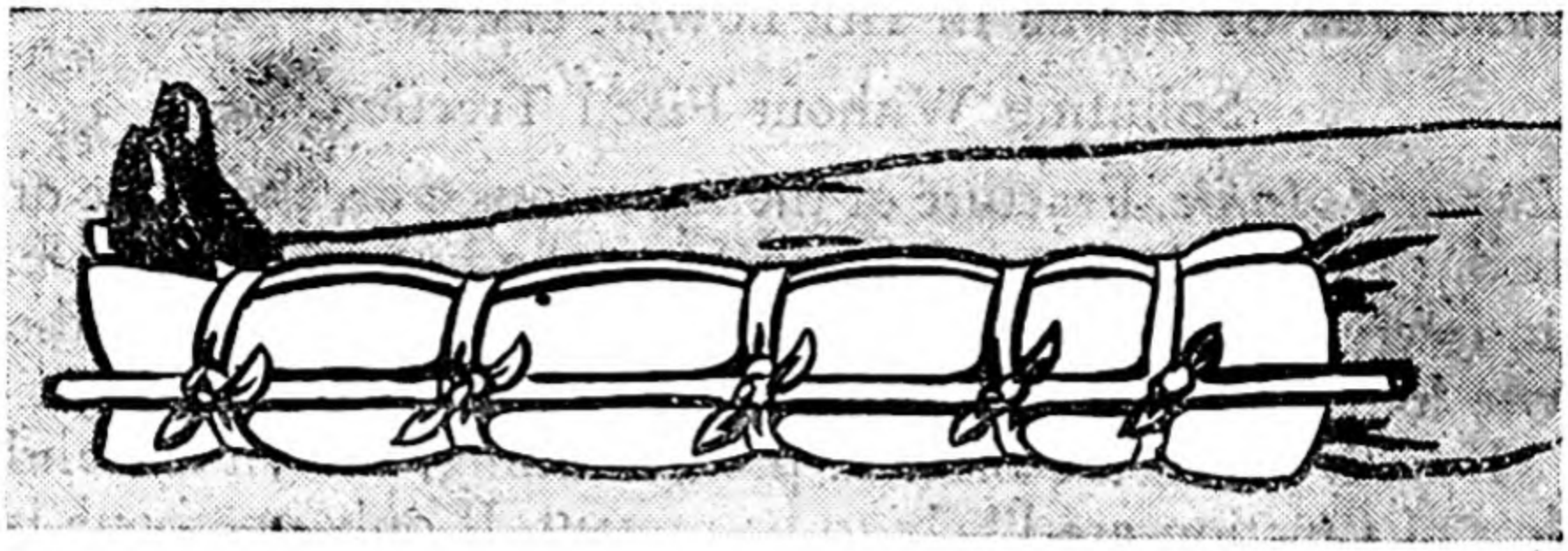


Figure 59

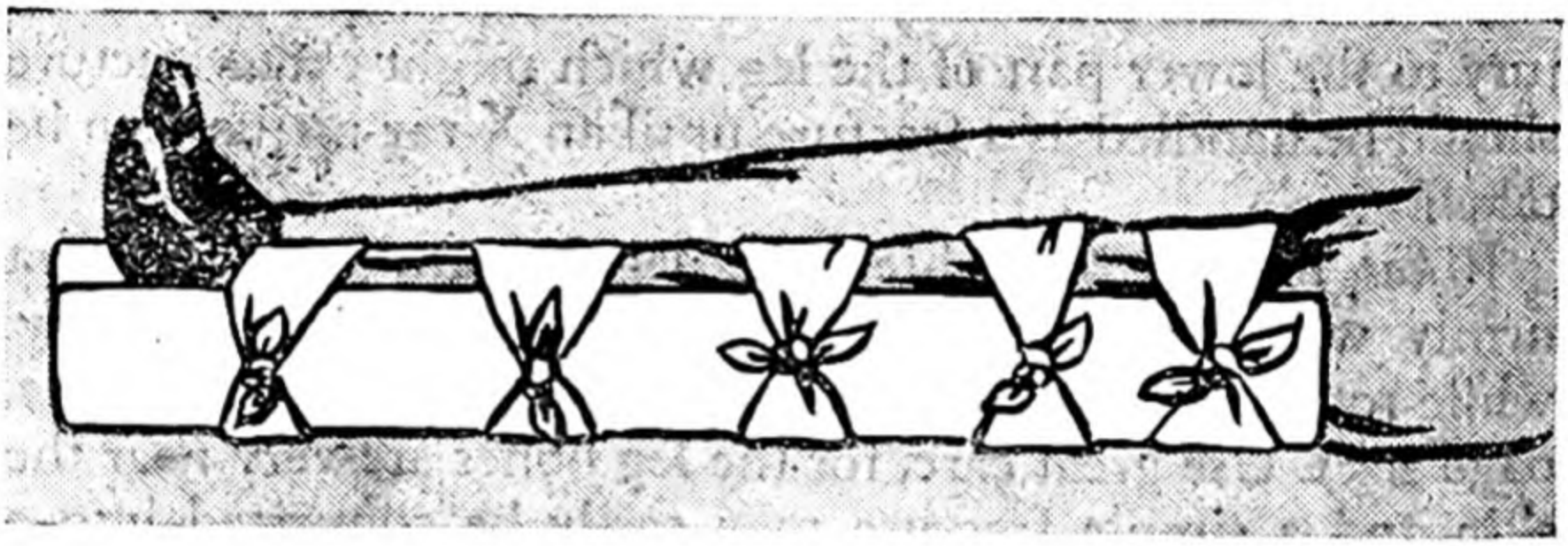


Figure 60

If it is impossible to obtain splints, place a padding of cloth between the legs and the thighs and tie feet, legs, and thighs together (Figure 61).

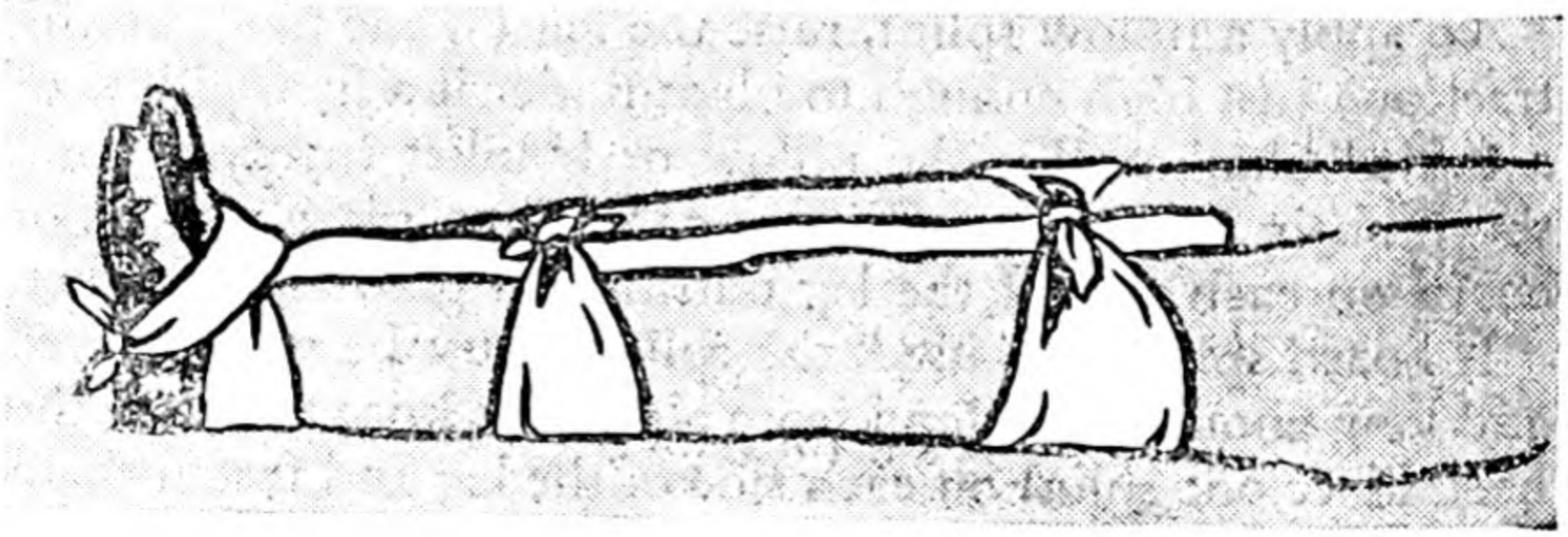


Figure 61

Foot and Toes. One or more of the many bones in the foot and toes may be broken when something heavy falls on or rolls over the foot. Pain, swelling, and possibly deformity are present.

What to Do. Place under the sole of the foot one well-padded splint about four inches wide and long enough to extend a little beyond the heel and the toes. Tie the foot snugly but not too tightly to the splint with cravat bandages. Place the center of the first bandage just above the heel. Bring the ends forward and cross over the instep, carry under the splint, bring up around the heel, and tie in front.

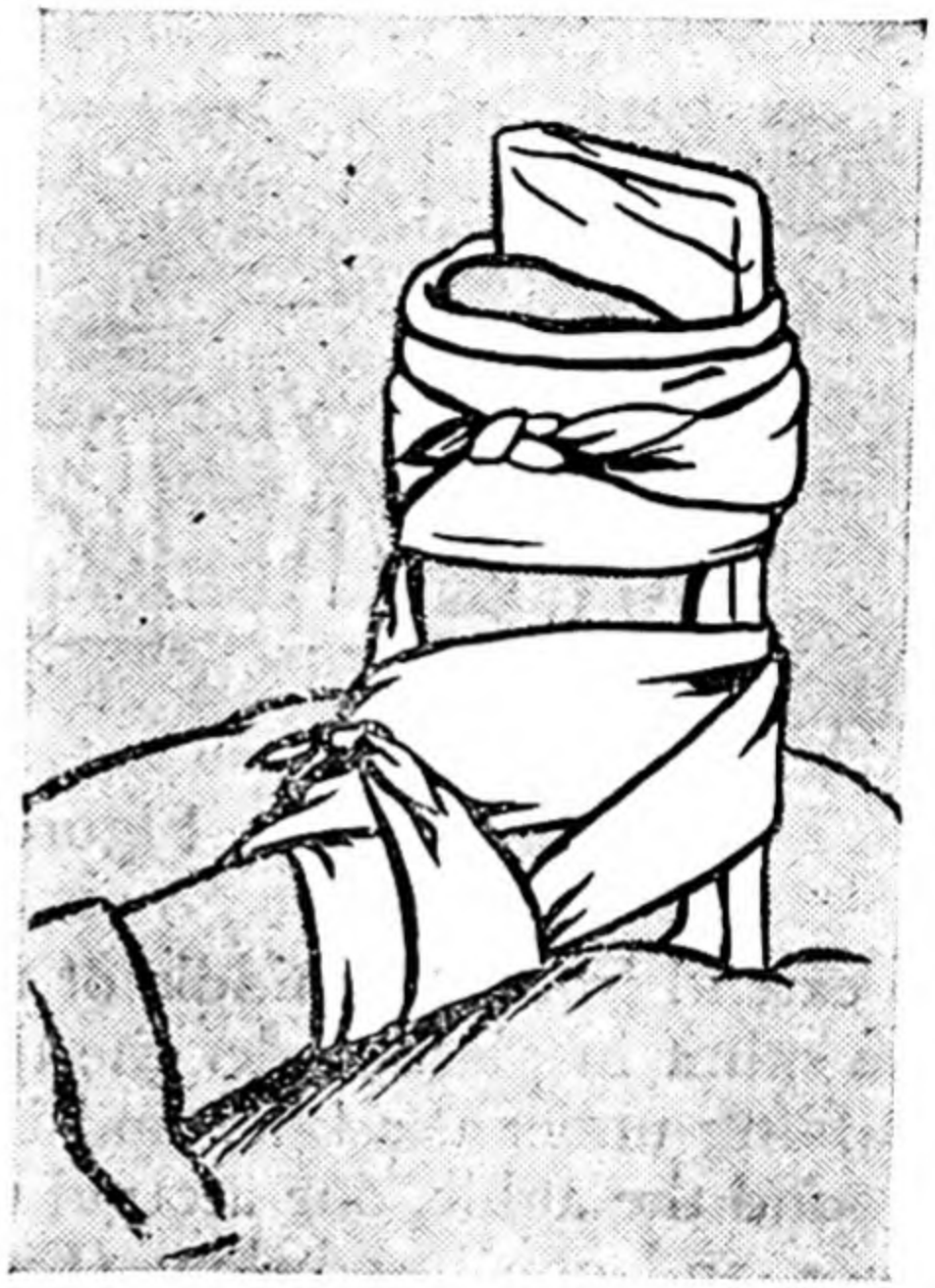


Figure 62

Place the center of the second bandage on top of the toes, carry the ends around the splint and foot several times and tie on top of the foot (Figure 62). Lay the foot on a pillow while waiting for or taking the victim to a doctor.

In case of compound fracture or other open wounds due to crushing, fasten a sterile compress in place over the wound with a triangular bandage (see under Bandaging, Figure 20, page 114) before applying the splint.

Kneecap. The kneecap is a flat, triangular bone called the patella, located just under the skin in front of the knee joint.

When the kneecap is fractured by a fall or blow it is usually possible to detect the line of separation at the break.

What to Do. Gently straighten the injured limb. Apply either a well-padded board or a pillow splint. The board splint should be at least four inches wide and long enough

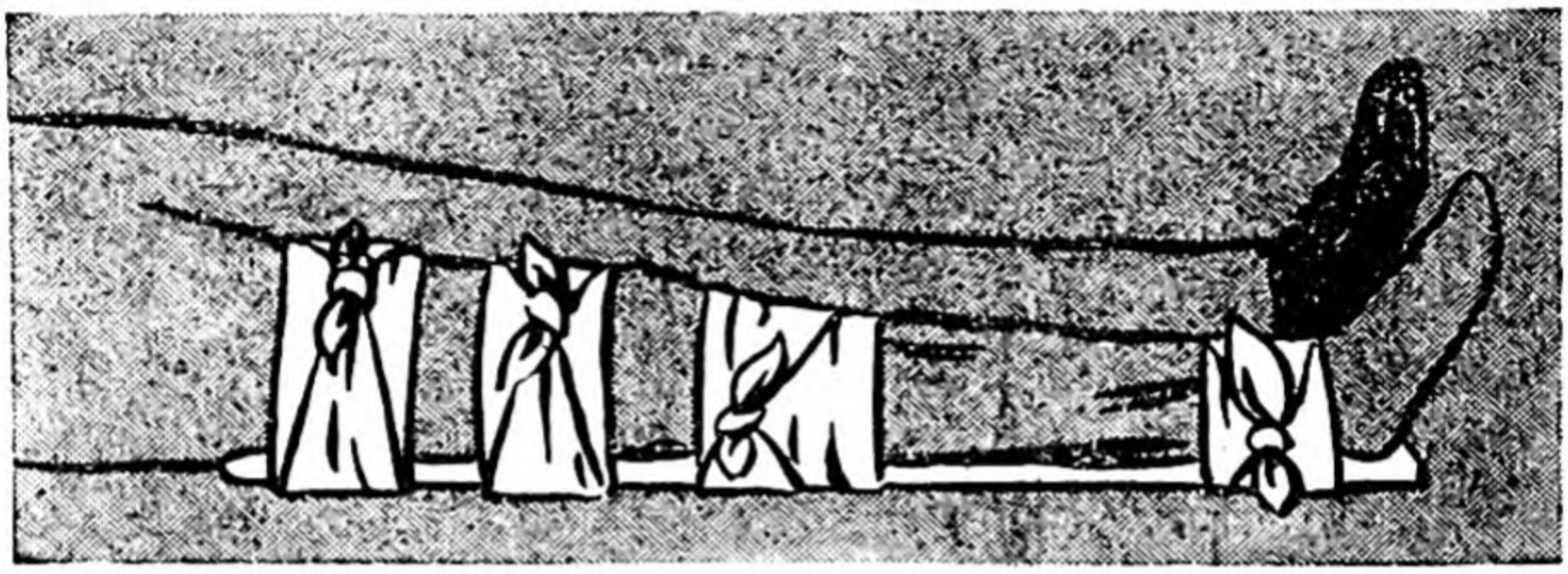


Figure 63

to extend from the middle of the thigh to the heel. Fasten the splint in place under the thigh and leg and stuff extra padding under the knee and heel. Use four bandages, one around the ankle, one around the thigh, one just above the knee, and one just below (Figure 63). Do not cover the kneecap with a bandage, as severe swelling is likely to occur quickly.

To apply a pillow splint, lay the leg on a pillow or a folded blanket with the edges rolled inward. The middle of the pillow should be behind the knee. Fasten the pillow or blanket in place (leaving the knee exposed) as in applying board splints. Greater rigidity may be secured by placing a board splint under the leg outside the pillow and tying it in place.

Thigh. In fracture of the thigh, the long bone called the femur, which extends from the hip joint to the knee joint, is broken. This is a very serious injury, and severe shock

nearly always occurs. It is apt to occur in old persons as a result of even a slight fall.

In addition to the general indications of fracture, the victim in most cases cannot lift his heel from the ground while lying on his back. The foot is often turned so that it lies on its outer side and the victim cannot raise it. The impaired limb may be shorter than the sound one.

What to Do. Carefully place the injured person on his back. With one hand under the back of the heel and the other over the instep, pull slowly and steadily while rotating the foot to its normal position (see Figure 67*a*, page 205). Very gently move the injured limb so that it is in line with the other and maintain traction (pull) while splints are being prepared.

Before applying the splints, seven cravat bandages or strips of cloth doubled lengthwise must be placed under the victim (Figure 64). Use a narrow stick to push the looped

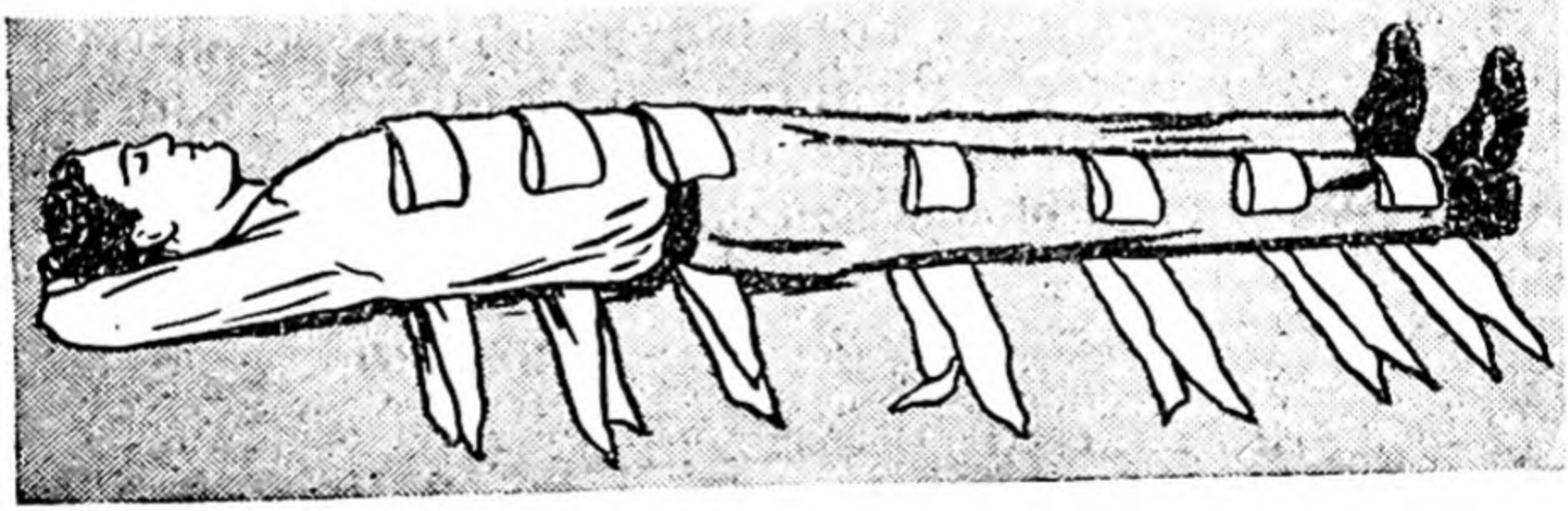


Figure 64

end of each bandage under the body and through to the other side. The easiest places to do this are at the arch of the back and the arches under the knee and ankle. From these points the bandages can be worked up or down to the correct positions. If it is necessary to lift the thigh in order to place the bandages, have one assistant support both ends of the broken bone while another assistant supports the foot.

Apply two padded splints. The one on the outside of the injured thigh should extend from the heel to the armpit, and the one on the inside of the leg, from the heel to the crotch. Fasten the splints in place by tying three bandages or cloth strips around the body over the outside splint and four more around the leg and thigh over the outside and inside splints (Figure 65).

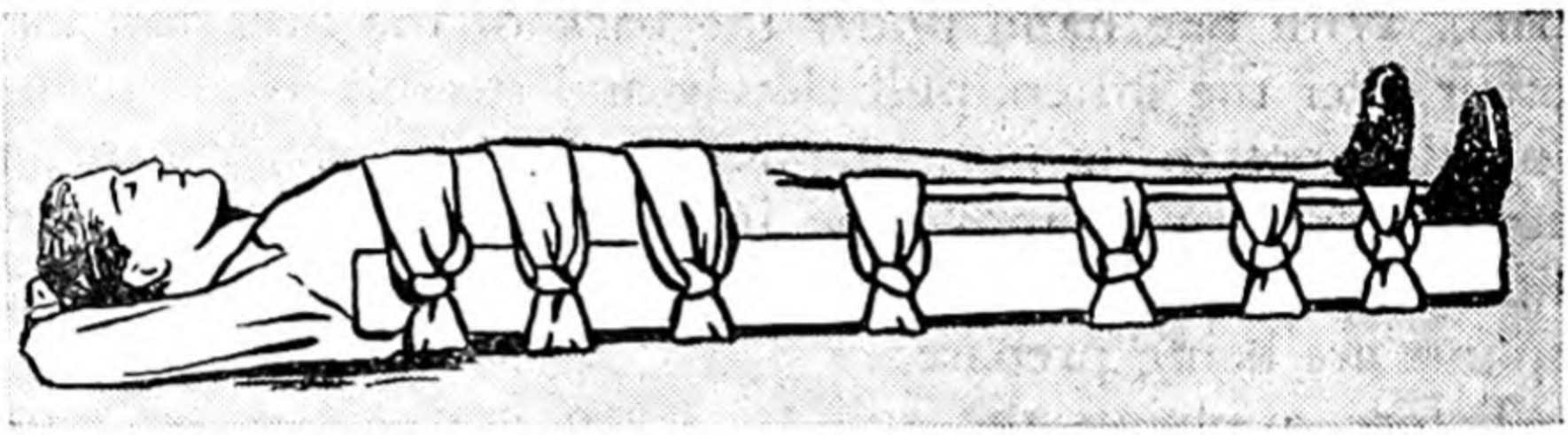


Figure 65

If no inside splint or no splints at all can be obtained, place padding between the thighs and legs and tie both legs together from hips to heels (Figure 66). The sound leg thus becomes a splint for the other.

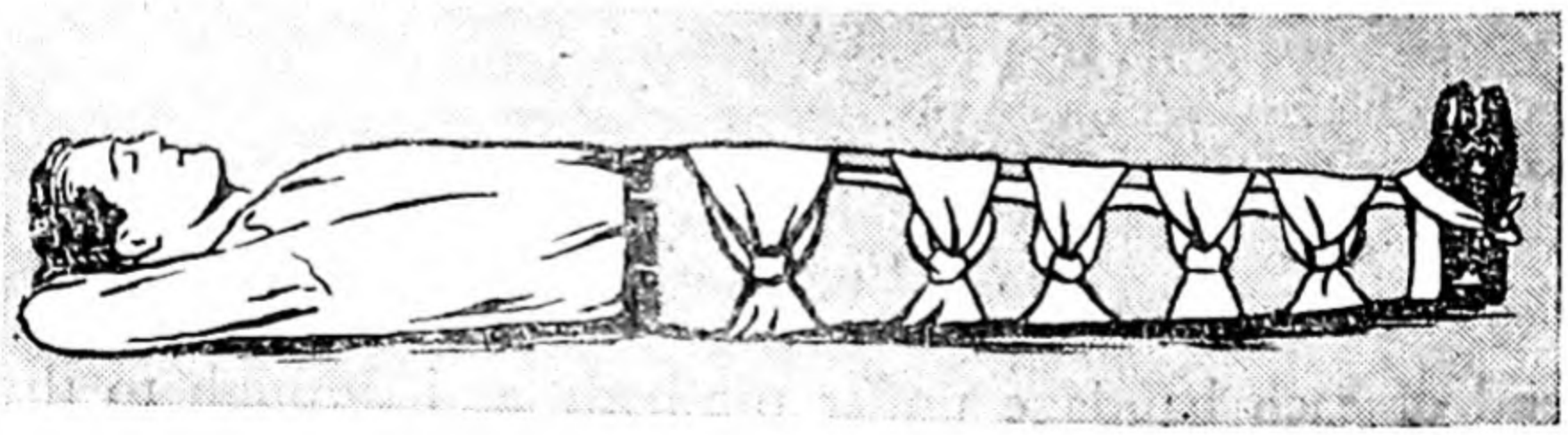


Figure 66

Until medical help is obtained, cover the injured person with blankets to conserve body heat and keep him quiet. Give him warm, stimulating drinks if he is conscious.

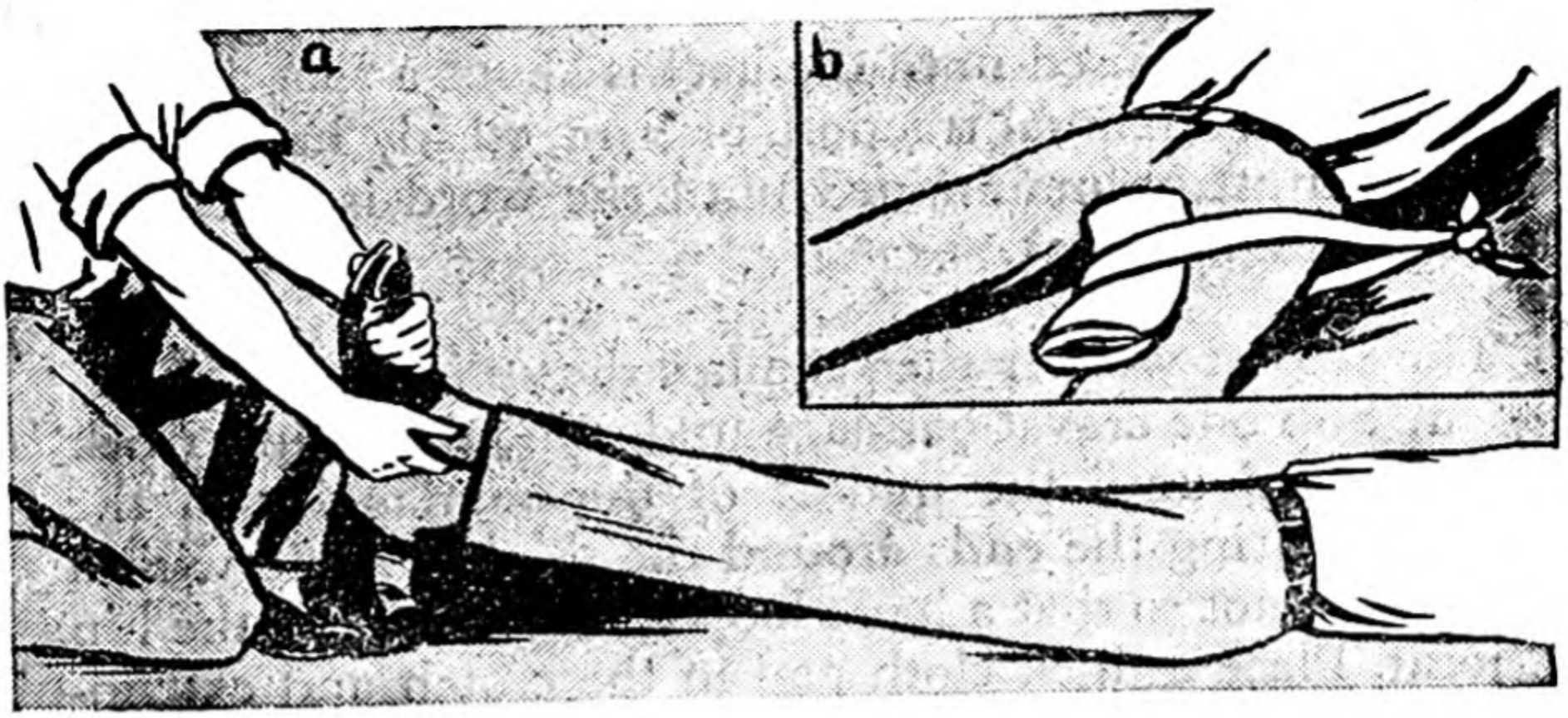


Figure 67

Splinting with Fixed Traction*

Long Bones of the Thigh or Leg. Fixed traction may be used for fractures of the long bones of the lower limbs for any break between the hip and the foot. If prepared traction fixation splints are not at hand when needed, rough and ready ones can readily be improvised. An improvised splint for applying fixed traction to the leg or thigh may be made from a board about four inches wide and two feet longer than the leg from crotch to heel. A wide V-shaped notch should be cut in each end of the board. If a board of the required width and length cannot be found, a strong, straight tree branch or pole with a crotch or fork at one end, an oar or paddle, or a ski pole or ski, or any similar article may be used.

In applying the splint to the leg, two first-aid workers are required. One person using both hands grasps the foot and exerts a firm steady pull, at the same time steadily and gently rotating the foot to a normal position, that is, at right angles to the leg as it would be if the person were standing

* See the caution on page 188.

with his toes pointing straight ahead. While doing this, the limb is slowly raised until the heel is about a foot above the ground. This manual traction, or firm, steady hand pull on the leg, must be maintained until the word is given to release it (Figure 67*a*).

The second worker then applies the splint as follows:

1. Slip one cravat bandage under the thigh and work it upward until the middle of the bandage is in the crotch. Bring the ends around the thigh and tie with a square knot so that a loose loop is formed above the hip joint. Place a thick cloth pad in the crotch and extending over the thigh so that the cravat bandage will not cut into the flesh or cut off circulation when the splint is applied (Figure 67*b*).

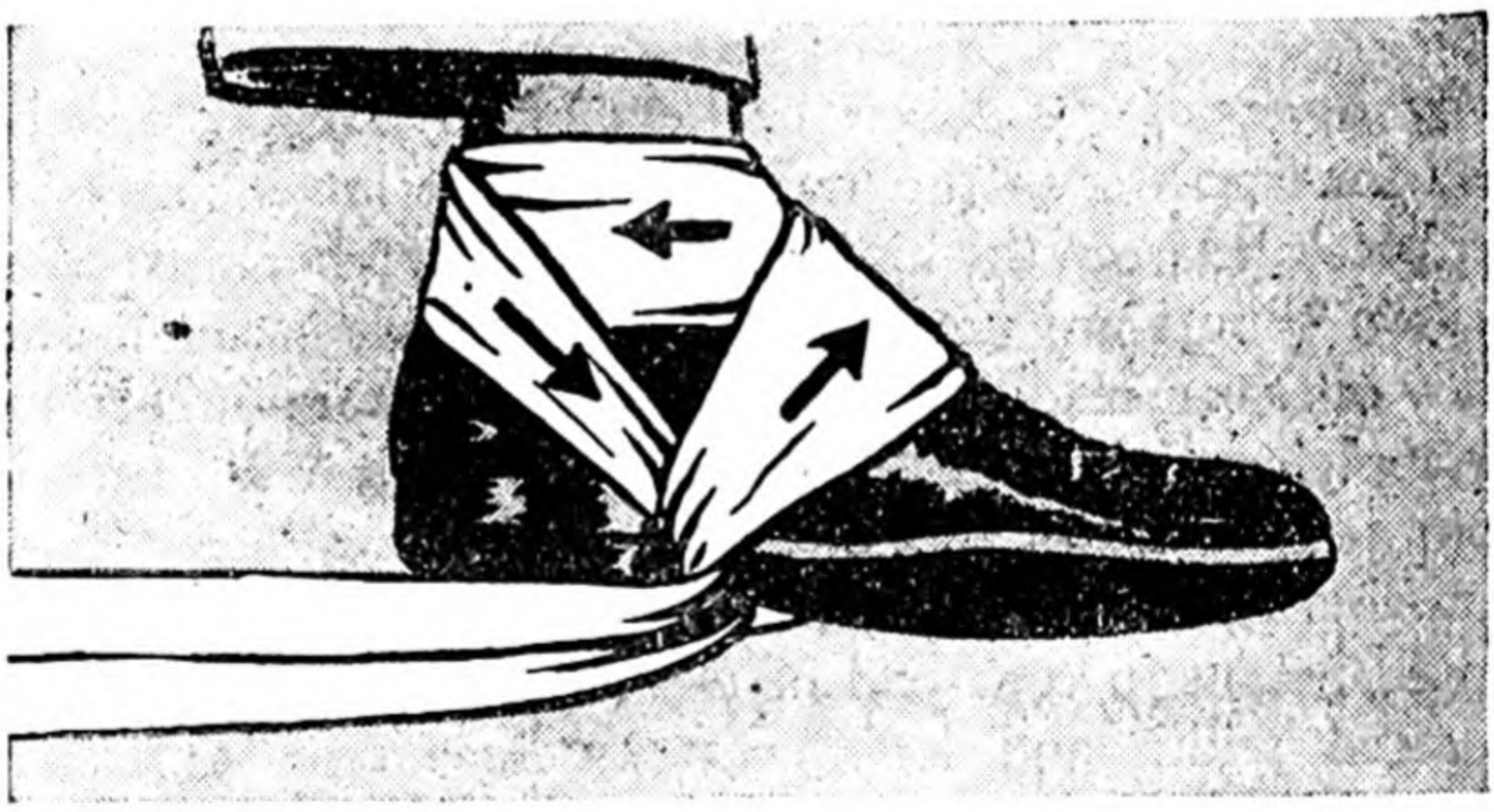


Figure 68

2. Tie two cravat bandages together and place the knot under the foot to form a stirrup. Cross the ends up over the front of the foot, carry them back around the ankle, and cross again behind and over the heel. Then slip the ends under the folds which form the stirrup on

each side and let them hang free. These free ends form the traction bands for the lower end of the splint (Figure 68).

3. Place the notched board or forked stick against the outside of the leg, with the upper end extending a foot above the crotch and the lower end a foot below the heel. Slip the looped cravat bandage above the hip into the notch in the upper end of the board. Tie it firmly in place so that it will not slip out. Slip both the traction bands hanging from the foot through the notch in the lower end of the board, wrap them around the end of the board in opposite directions, and tie them firmly in place. Insert a short stout stick between the two traction bands below the foot and twist, engaging both bands, until all slack is taken up and a strong pull established (Figures 69*a* and 69*b*).

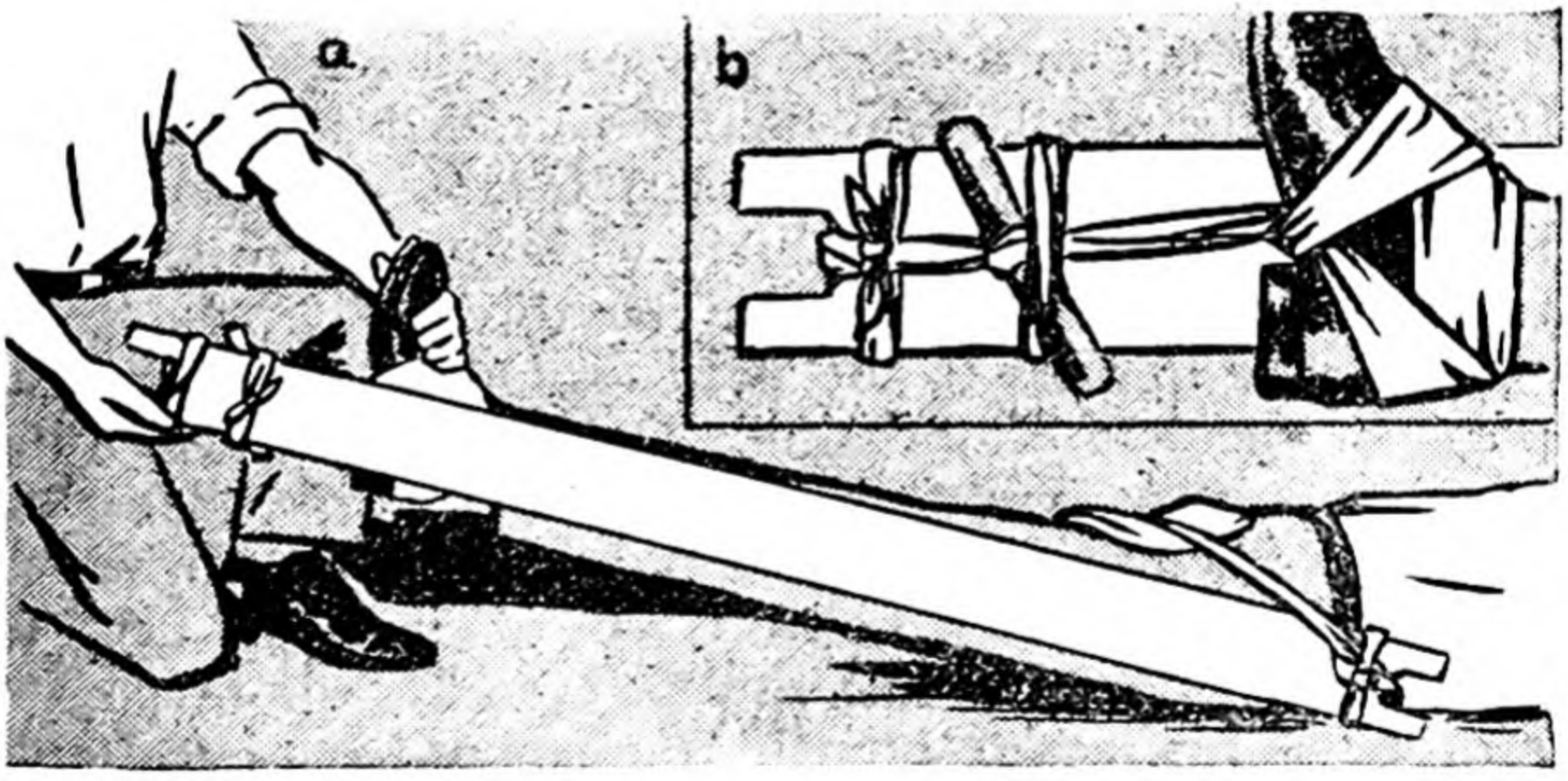


Figure 69

4. Stuff padding between the leg and the board to ease pressure wherever it is apparent.

5. Tie the splint to the limb firmly but not tightly with cravat bandages placed at the crotch, just above the knee, just below the knee, halfway between knee and ankle, and at the ankle but not over the point of the break. After applying the splint, do not let the heel touch the ground. The leg may be suspended in a loop of cord tied at the end of the splint, or the end of the splint may be placed on a box, block of wood, stone, or the curbstone or similar object.

Fracture of Bones in the Head

Skull Fracture. Fracture of the skull usually is caused by a severe blow or fall on the head. The bone or bones at the top, front, sides, or back of the head may be fractured. There may be a scalp wound and a fissure or crack in the skull, or there may be a crack in the skull without a wound. If pieces of broken skull are driven inward, the injury is called a depressed fracture.

A blow or fall on the head may bruise the brain without fracturing the skull. This injury is called a concussion. Unconsciousness after a head injury is most commonly due to a lacerated wound of the brain without a depressed fracture and sometimes without any fracture.

All severe injuries to the head should be considered as possible fractures of the skull. Do not try to determine whether possible skull fracture is a simple skull fracture, a depressed fracture, or a concussion. In any accident in which a person has received a severe fall or blow on the head or who has been knocked unconscious even for a minute, give care for skull fracture even if you cannot see or feel one.

Objective signs and symptoms vary according to the location, type of fracture, and damage done to the brain.

1. Generally there is a visible bump or cut on the forehead or scalp.
2. The victim may or may not be partially or wholly un-

conscious. A mixed blood and serum discharge from one or both ears and sometimes from the mouth and nose and into the eyes is a significant sign of fracture of the base of the skull.

3. Inequality in the size of the eye pupils is a sign that the brain has been damaged by pressure or bleeding into it.

What to Do. Keep the injured person lying down, with his head raised by a pillow or pad if his face is flushed; on a level with the body if his face is pale. Move him in this position if he must be moved. Do not permit him to sit up or to walk, even if he wants to, until he has been examined by a physician. Keep him warm with blankets and with covered hot-water bottles or bricks placed at his feet. Apply cloths wrung out of cold water or an ice bag to the head. *Do not* give a stimulant, as this may increase bleeding inside the skull or cause the rupture of bruised blood vessels.

If the scalp is bleeding, apply a sterile gauze compress and bandage it in place (see under Bandaging, Figure 26, page 119). Bandage lightly, as pressure may force broken or crushed bones inward. Do not place the knot of the bandage over the wound. If pressure must be applied to check severe bleeding, be sure the pressure is evenly applied over the wounded area.

Jaw Fracture. By fracture of the jaw is meant a break in the lower jaw which moves up and down on a hinge joint in opening and shutting the mouth and in chewing. When the upper jaw or the cheekbone is broken or crushed, apply a bandage as described under Bandaging, Figure 23, page 116.

In fracture of the lower jaw, the jaw usually sags down and saliva mixed with blood trickles out of the corners. Some teeth may be loosened or knocked out of line at the break. Talking, eating, drinking, and swallowing are painful and difficult.

What to Do. Gently raise the lower jaw until the lower teeth meet the upper teeth. Fix it in this position until medical aid can be obtained, by applying a cravat bandage as follows: Carry one end of the bandage under the chin and the other end over the top of the head. Cross the ends at the side of the head on a level with the forehead. Bring one end around the forehead and the other end around the back of the head and tie on the side opposite the crossing (Figure 23, page 116).

Trunk Fractures

Collarbone. Fracture of the collarbone means a break in the clavicle, the slender, curved bone which lies just in front of and above the top ribs.

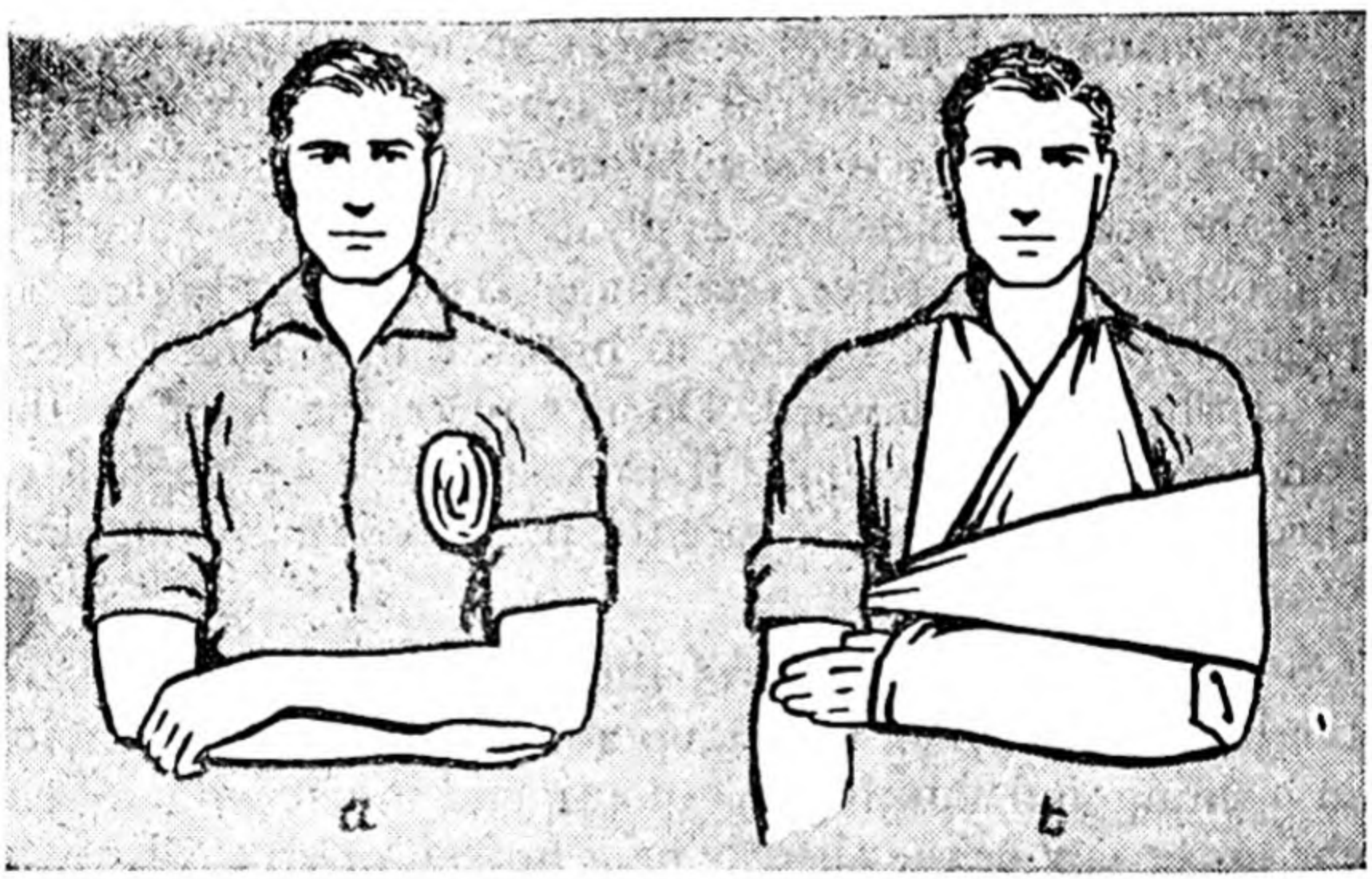


Figure 70

As the victim stands or sits with his arms hanging, the shoulder on the injured side is lower than the opposite shoulder and tends to droop forward. Usually the broken ends can be felt by running the finger gently along the collarbone. The usual signs of fracture also are present.

What to Do. Place a large pad of cotton or other soft material in the armpit and between the chest and the arm so that the elbow is held away from the side of the body (Figure 70*a*). Put the arm on the injured side in a large triangular-bandage sling, with the hand raised to a point slightly above the elbow. Then tie the arm to the body with a cravat bandage or any long strip of cloth (Figure 70*b*).

Pelvis. In fracture of the pelvis one or both of the hipbones forming the sides and front of the pelvis may be broken. The break occurs most commonly in the narrow bridge of bone formed where the hipbones join in front. The urinary bladder which lies just behind this bony bridge is frequently injured. Severe shock is apt to be present.

Pelvis fracture is frequently difficult to detect. If an injured person complains of great pain in the pelvic region after an injury in which the hips or loins have been squeezed, crushed, or struck violently, handle the injury as a broken pelvis.

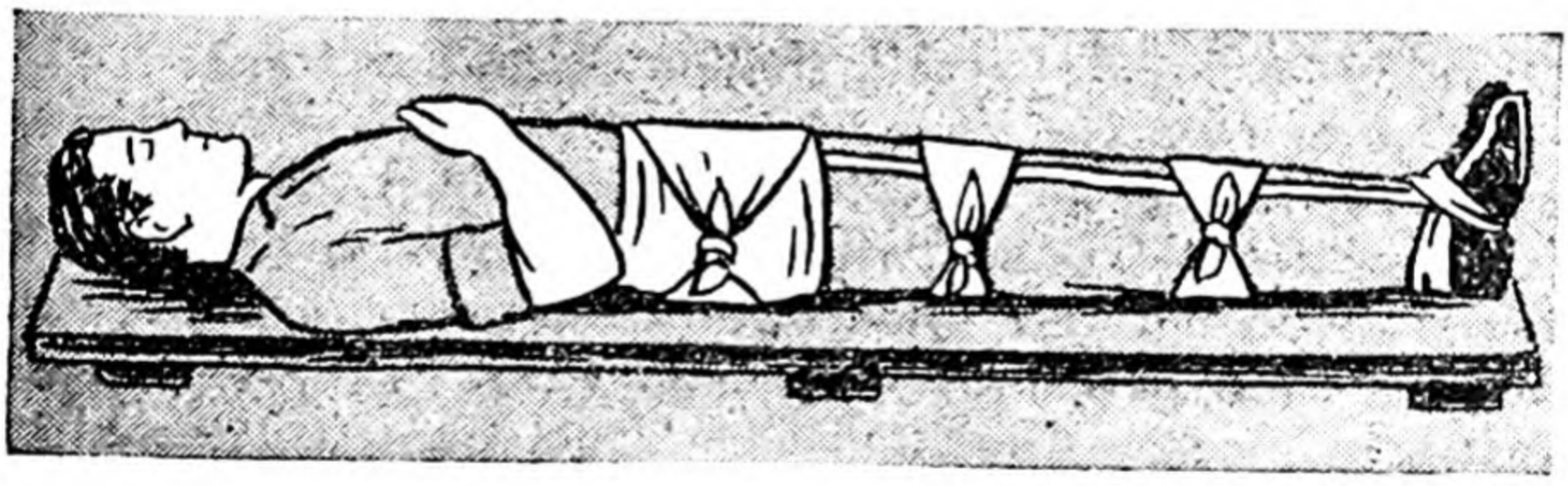


Figure 71

What to Do. Place the victim gently on his back on a rigid stretcher, door, or board about seven feet long and twelve inches wide. Pass a cravat or broad roller bandage (at least six inches wide) around the pelvis and tie it at the side. The bandage should be firm enough to prevent movement of the fractured parts but not so tight as to press

broken bones inward. Pad well between the legs and bandage the ankles and knees together (Figure 71). Tie the victim's body to the stretcher with bandages passed around the body and the stretcher at the chest, thighs, and legs.

Ribs. A rib may be fractured by a direct blow or by severe squeezing of the chest, in which case the broken ends of the bone may be driven inward. Also, penetration of the chest wall by missiles or weapons may cause fracture of any rib in the path of the penetrating object.

Severe cutting pain is felt at the point of the break, which becomes worse whenever the injured person takes a deep breath. The victim may describe this pain as a "stitch" in the side. Grating (crepitus) may be felt by placing the palm of the hand over the broken rib.

If a lung has been punctured by the broken end or ends of the rib, the injured person coughs up bright frothy blood. If the liver or spleen is injured, internal bleeding will occur and the victim will quickly show the classical signs of that condition. That is, he will become cold and clammy, with a "thready" pulse and weak, shallow breathing.

What to Do. If there is no sign of injury to the lungs or other internal organs, place the center of a broad cravat bandage over the break, when it has been located, and tie it loosely with a single knot at the side opposite the break. Place a cloth pad under the knot. Then have the patient exhale while you tighten the bandage. Complete the knot when the patient says the bandage feels comfortable. Apply two more cravat bandages in a similar manner, one overlapping the first from above and the other from below (Figure 72). If regular bandages are not available, restrict the movements of breathing by wrapping a strip of muslin or a towel tightly around the chest and pin it at the side with safety pins. Hold the bandage in place by straps running over the shoulders.

If there are signs of injury to the lungs or other organs—

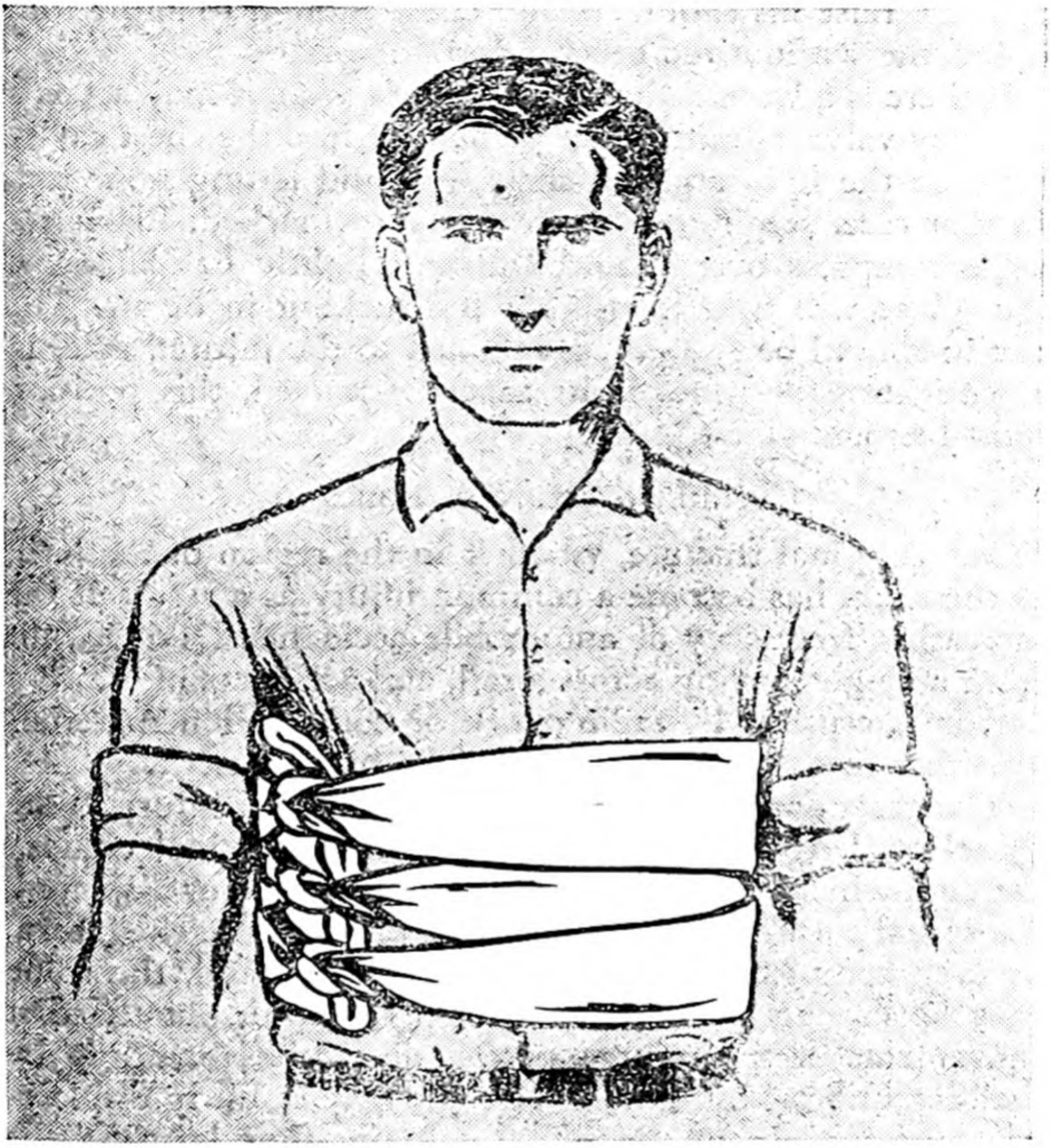


Figure 72

for example, coughing up blood—do not apply bandages. Further pressure may drive the sharp end of the rib deeper into the organ. All you can do until the doctor or an ambulance comes is to have the victim lie down and incline him toward the injured side. Place rolled blankets, coats, or sandbags under the opposite side. If respiratory distress is

marked, raise his shoulders and chest enough to allow him to breathe without too much effort.

If there is a wound through the chest wall, it may act as a one-way valve, admitting air through it into the chest cavity between the lung and the chest wall and letting none out. In that case, respiratory distress is very marked. Placing a large compress over the wound and lightly bandaging it into place will help to prevent the sucking in of air. The victim should be supported, inclined to the injured side, in a semisitting position. If he must be moved, this position must be maintained.

Trunk, Fracture of Bones in

Spine. A spinal fracture, whether in the region of the back or the neck, has become a common injury as a result of the increasing frequency of automobile accidents. Diving, falls from a height, falling across a rail, and accidents in which a person is crushed by falling rock or construction materials are other common causes of a broken back or neck.

The great danger in spinal fracture is that of injury to the spinal cord. If any of the vertebrae in the spinal column through which the spinal cord runs are crushed or displaced, the spinal cord at that point may be pressed, stretched, torn, or even completely severed. On the other hand, the spine may be broken without damage to the cord, but the first movements of the injured person or careless handling by well-intentioned but ignorant people may result in displacement of sections of the spinal column, thus injuring the cord. So many cases of irreparable damage have resulted from the injudicious or incorrect moving of persons who have sustained injuries of the neck and back that the Fracture Committee of the American College of Surgeons, in co-operation with the American Red Cross, has issued special instructions for the first-aid handling of such cases.

What to Do. In any case in which the circumstances suggest spinal injury, even though definite signs are not appar-

ent, the victim must be handled as if he had a fractured spine.

Do not allow him to sit up. Do not lift his head even to give him a drink of water. Do not move him at all until medical aid arrives, unless it is necessary to get him to a zone of safety.

When the spinal cord is cut or subjected to pressure, paralysis of the body occurs below the point of the injury. *If the victim is conscious,* he may be able to tell where he has been hurt. Ask him to move his feet and toes and hands and fingers. If he cannot move his feet and toes but can move his fingers, his back is probably broken. If he cannot move his fingers, his neck is probably broken. In both cases the spinal cord is injured but possibly not severed.

If the victim of an accident is unconscious and you suspect a spinal fracture, follow the procedure for the first-aid care of a broken neck.

Moving a Person with a Broken Neck

If it is essential to move a person with a broken neck, first secure a board, door, or shutter at least fifteen inches wide and at least five feet long. Place it beside the victim so that one end extends at least four inches beyond the top of his head.

The victim of a broken neck must be transported lying on his back. If he is already lying on his back, one person should kneel at his head and steady it with both hands so that the head, neck, and shoulders can be moved as a unit in a straight line with the body. One or more persons should then grasp the clothing at the shoulders and hips and carefully pull the victim sideways onto the board or door, so that he rests *face upward,* with his head level with the rest of his body and with his arms at the sides. *Under no circumstances should his head be tilted forward or sideways.* His arms may then be crossed over the chest and held there by pinning his sleeves together with safety pins. Several straps

or bandages should be passed around the injured person and the board to keep him from sliding about during transportation. No pillow should be placed under the head, but articles of clothing or improvised small sandbags may be packed against the sides of the head to keep it from rolling during transportation. The board with the victim on it may then be placed on a blanket or stretcher and carried by two or more bearers.

If the victim is lying on his face, one person kneeling at the head must place both hands at the sides of the head to hold it steady and in line with the body while one or more persons grasping the victim's clothing at the shoulders and hips gently roll the victim over onto the board or door to the face-up position. The head and trunk must be turned in unison, and the head must not be tilted forward, backward, or sideways.

Moving a Person with a Broken Back

The victim of a broken back must be transported *face downward.* If it is essential to move him, first secure a wide board, door, or shutter at least five feet long and place it beside the victim so that one end extends several inches beyond the top of his head. If the victim is lying on his back, two or three persons should kneel on the other side of the board and, reaching across both board and victim, grasp the victim's clothing on the far side and slowly and gently roll him over so that he lies *face downward on the board.* The body must be moved as a unit, with no bending of the back. One forearm may then be bent to support the victim's head. If more assistants are available, one may steady the victim's head and another his feet as he is being rolled over. The face-downward position is essential for a person with a broken back, as this position removes pressure from the spinal cord.

If a board or door is not available, the victim may be rolled over so that he lies face downward onto a blanket

folded lengthwise. Four bearers (if necessary, two) then lift the blanket at the level of the victim's shoulder and knees and carry the victim, *remaining face downward,* to a stretcher or a place of safety. Several straps or bandages should be passed around the victim and the board or stretcher to hold him in place while he is being transported.

If the victim with a broken back is lying face downward when found, he should be drawn sideways onto a board or door laid close beside him. One person should protect the victim's face during this process. If no board or door is available, a blanket may be used. Roll one long side of the blanket tightly toward the center and place the roll snugly against the victim's body. Several assistants should then kneel on the opposite side and, reaching across the victim, gently roll him up just far enough to permit other helpers to push the blanket under him. He should then be gently rolled the other way so that the rolled half of the blanket can be unrolled. The blanket with the victim lying face downward on it is then placed on a stretcher or carried to a place of safety.

If the victim is lying sideways or in a crumpled position when found, he should be straightened out very gently. Then using the precautions described above he should be rolled onto his back on a board or door, if his neck is broken, or onto his face on a board, door, or blanket, if his back is broken.

Caution. In all cases of spinal injury, whether of the back or neck, the victim must be kept warm with blankets or other wraps during transportation or while waiting for medical aid. If it is necessary to transport him, the stretcher-bearers and ambulance driver must be warned to proceed very slowly and carefully and to avoid jolts and jars.

FREEZING, GENERAL

A person may be overcome by cold when he has been exposed to severe cold for a long time. At first he feels numb,

drowsy, and very tired and finally lapses into complete unconsciousness.

What to Do. After rescue, put the victim in a cool room, wrap him in blankets, and, if breathing has stopped, administer artificial respiration (see Artificial Respiration, pages 67-70). Rub his limbs under the blankets with cool, wet cloths to restore circulation, but take care not to rub over areas which are frostbitten. These areas may be identified by the waxy-white color of the flesh (see Frostbite).

When the victim is thoroughly thawed out, raise the temperature of the room gradually or place him in a tub of tepid (not hot) water and gradually warm the water until he feels comfortable. Then put him to bed between warm blankets, give him a warm drink of coffee, tea, cocoa, or heated milk, and leave him to rest.

In cases in which there has been prolonged exposure to cold without frostbite or collapse, give the victim hot, stimulating drinks and put him in a warm bed.

FROSTBITE

In frostbite the tissues in some part of the body are actually frozen. Exposure to severe cold, especially if a high wind is blowing, is the cause of frostbite. The parts most likely to be frozen are the nose, cheeks, ears, fingers, and toes.

Signs and Symptoms. Since the blood vessels are constricted in the frozen area, the blood cannot circulate, and the color of the flesh is a peculiar waxy white.

Freezing of the ears, nose, and cheeks may not cause pain and the victim may not know what has happened until someone notices it and tells him. Freezing of the hands and feet usually causes considerable pain.

What to Do. The object of the treatment is gradually to thaw out the frozen tissues and restore the circulation of blood. Using a body surface as a warmer is a good way to do this. For example, cover a frozen ear, cheek, or nose with

the hands, or if a hand is frozen, hold it in the armpit or between the thighs. Or the frozen part may be thawed very gradually by applying cloths wrung out in water. Start with cool water and very gradually increase the temperature of the water. When the color of the frostbitten area becomes normal, the victim may be taken into a warm room.

Caution. Do not apply outside heat by placing the victim near a stove or radiator or by bathing the frozen part with hot water. The thawing should be done by the blood itself as it slowly warms its way into the frozen blood vessels. Application of outside heat is likely to result in the rupture of blood vessels and may lead to gangrene.

Also do not rub the frozen area. It is especially dangerous to rub it with snow. It is very easy to bruise or tear frozen tissues, with the result that gangrene may develop.

G

GANGRENE. *See under* Bleeding, page 82.

GAS ASPHYXIATION

Carbon monoxide is the gas responsible for most cases of asphyxia by gas inhalation. This odorless, deadly gas has the power of "gripping" the oxygen-carrying red pigment (hemoglobin) of the red blood corpuscles more rapidly, more easily, and more firmly than oxygen can. Hence if it is released in any quantity in sealed rooms, garages, mine workings, and so on, it causes gradual asphyxia by keeping the blood corpuscles from taking up oxygen from the air breathed in.

Carbon monoxide is produced in the burning of all carbon-containing substances, such as coal, oil, wood, and gasoline, when there is not sufficient oxygen present for complete combustion. It is present in the smoke from burning buildings, in the fumes from coal stoves and furnaces, especially when they have been banked for the night, and

in automobile exhaust fumes. An automobile may produce enough carbon monoxide in five minutes to make the air deadly in a closed garage. Exhaust gases leaking up through the floor boards in a closed car may contain enough carbon monoxide to make the occupants feel sick or faint.

Manufactured gas used for lighting, cooking, and heating contains carbon monoxide. It may escape from ill-fitted water heaters and gas stoves, loose gas fixtures and valves, leaking gas tubing, and gas furnaces not connected to outdoor air by flues. Many people think that accidental poisoning from illuminating gas occurs only when there is a leak. This is not true, as carbon monoxide may be given off when the gas is burning. Natural gas which normally does not contain carbon monoxide may produce it when the flame comes in contact with cold metal, as when a large metal boiler filled with water is placed over a gas flame.

Rescue. In rescuing a person who has been overcome by carbon monoxide in a gas-filled enclosure, such as a kitchen or garage, make sure that you protect yourself from the gas, or arrange for your rescue in case you are overcome. *A damp cloth tied over the mouth and nose is not a gas mask.* It may strain out acrid substances in smoke fumes which irritate the respiratory tract, but it does not prevent the entry of carbon monoxide. Many people have died in the mistaken notion that a cloth mask would protect them from gas asphyxia.

If an effective protective mask is on hand, use it. If not, tie a rope firmly around your waist and instruct someone on the outside to hold the other end while you go to the rescue. Then if you fall you can be dragged to safety. Before going to the rescue, instruct another assistant to summon a physician and the gas squad from the fire department or the gas company, so that the proper treatment can be administered as quickly as possible.

Signs and Symptoms. The brain is the part of the body most seriously affected by the oxygen starvation caused by

gas poisoning. Unconsciousness and stoppage of breathing are the result. Death quickly occurs unless prompt measures are taken to prevent it. The skin usually turns cherry red, although it may become blue as in suffocation.

Warning symptoms of gas asphyxia, such as those which may be felt when a little gas is escaping in a poorly ventilated room or closed automobile, are usually yawning, dizziness, ringing in the ears, mental dullness and confusion. These symptoms may appear so gradually that the victim does not notice them until he is affected to the point of not being able to walk or even crawl into the fresh air. Unless rescued he will eventually be asphyxiated.

What to Do. Get the victim into fresh air as quickly as possible. In cold weather take him to a comfortably warm room rather than outdoors. If breathing has stopped or comes in gasps, start artificial respiration at once (see Artificial Respiration, pages 67-70).

In carbon-monoxide asphyxia, the administration of more oxygen than is present in ordinary air hastens and may even be necessary for recovery. Better still is the administration of a mixture containing 93% oxygen and 7% carbon dioxide. The carbon dioxide stimulates faster, deeper breathing, while the oxygen is driving the carbon monoxide out of the blood. This gas mixture is given through an oxygen-carbon dioxide inhalator. The face mask of the apparatus is held tightly over the face of the victim by one person, while another gives artificial respiration. An approved inhalator and persons trained in its use usually can be secured from the fire department or the local gas company. It is important to keep administering the gas mixture after natural respiration has been established until the victim is fully conscious, and to be ready to readminister it at any time within the next twenty-four hours if normal respiration becomes too shallow. It must be remembered that an inhalator is an aid to recovery from gas asphyxia, but it cannot restore breathing. In asphyxia due to carbon monox-

ide as well as in other types of asphyxia, *immediate artificial respiration is essential* and there must be no delay while waiting for an inhalator.

GASES, WAR. *See under* War Injuries, pages 330-349.

GASOLINE, BENZINE, AND NAPHTHA FUMES INHALED

Gasoline poisoning may be caused by the fumes of gasoline in motor launches and in enclosed spaces shut off from free access to the outside air. The vapors of gasoline, benzine, and naphtha may be inhaled when they are used as paint solvents, in dry cleaning, in work on automobiles, and so on.

Gasoline also may be swallowed by mistake when in the process of siphoning gasoline from a container by means of a hose, or cleaning fluids may be swallowed by a child. For Gasoline, Benzine, Kerosene, and Naphtha Swallowed, see Poison Table, Petroleum Distillates, page 262.

Signs and Symptoms. Inhalation of the fumes or vapors first causes dizziness, nausea, constriction of the throat, headache, staggering and trembling of the hands and arms (the so-called "naphtha jag"). Later there is partial or complete unconsciousness, slow respiration, weak thready pulse, and convulsions that may end in death. Persons recovering from the poison tend to develop mania.

What to Do. Get the victim into fresh air as quickly as possible. Remove all clothing if it is soaked with gasoline, benzine, or naphtha. Administer artificial respiration if the victim is not breathing. Give stimulants when the victim becomes fully conscious. Keep him lying flat, quiet, and warm until the doctor comes.

GUNSHOT WOUNDS. *See* Punctured Wounds, page 319.

H

HAND, BANDAGES FOR. *See under* Bandaging, pages 111, 113.
FRACTURE OF. *See under* Fractures, page 194.

HANGING. *See* Choking.

HC MIXTURE (a screening smoke used in warfare). *See under* War Injuries, page 343.

HEAD INJURIES

It is impossible for a layman to determine the extent of any accidental injury to the head. No concrete signs of head injury, such as bleeding, may be apparent but the victim's mental condition may indicate that the brain has been severely jarred (concussed) or the skull fractured. The disturbance of consciousness may vary from a short period of semiconsciousness or a dazed or confused state to one of deep coma. The victim may be restless and delirious.

If a head injury results in only a momentary lapse of consciousness, the injured person may see no reason for being examined by a doctor. The only sane thing to do, however, is to urge the victim, even though he "feels perfectly all right," to get medical attention at once.

For first-aid care of head injuries, see under Bandaging, pages 116-120; Bleeding, page 132; Burns, page 141; Skull Fracture, page 208.

HEADACHE REMEDIES, POISONING FROM. *See* Poison Table, page 258.

HEART ATTACK

A so-called heart attack may be due to any one of a number of varieties of heart disease or to severe shock.

First aid depends upon the signs and symptoms as follows:

1. The agonizing pain known as angina pectoris is most commonly associated with heart disease. It almost always occurs in connection with bodily effort, or emotional strain. There is a tendency for the pain to radiate from the upper chest to the left shoulder and down the

arm to the fingers. Angina pectoris is frequently due to interference with the blood supply of the heart muscle, which is in turn caused by disease of the arteries which supply the heart muscle itself with blood. Sometimes the pain of angina pectoris may be caused by a disturbance of the functioning of the heart without organic disease.

2. Great shortness of breath during or after ordinary exertion, when due to heart disease, is usually produced by congestion in the blood vessels in the lungs. Attacks of heavy breathing sometimes occur at night. During an attack the face often looks flushed and swollen. The sick person cannot lie down. Often he insists that he must sit up and lean forward or even stand up and lean forward in order to breathe.
3. A heart attack marked by a pale face and weak pulse greatly resembles a fainting attack. Pain in the region of the heart may be present and the person affected may or may not become unconscious. If no pain is present before the person faints, heart attack may be suspected if recovery is not rapid.

What to Do. In cases marked by severe pain or fainting, keep the person lying down to avoid any extra strain on the heart. In case of shortness of breath prop up the person so that he can breathe with as little effort as possible. In all cases keep the ill person warm and very quiet before the doctor arrives and do what you can to allay fear. Find out whether the person has medicine prescribed by a physician for an attack of this kind and, if so, help him to take it. A stimulant, such as aromatic spirits of ammonia or hot coffee or hot tea, may do good and can do no harm.

HEAT CRAMPS

Heat cramps may develop in stokers, miners, steelworkers,

bakers, and others who sweat profusely as a result of exposure to intense heat. Profuse sweating drains large amounts of salt and water from the body, and it is this loss of salt which is responsible for heat cramps. In the majority of cases heat cramps may be prevented by adding salt to the drinking water during very hot weather or while working in a place where the heat is intense. Salt tablets are now commonly given to workers in industrial establishments where the heat hazard is high.

Signs and Symptoms. Spasms usually involve successively groups of muscles of the abdominal wall or limbs. The onset is apt to be sudden, and the cramp may occur intermittently for twenty-four hours, seldom longer.

What to Do. Have the victim lie down with his head level with or lower than the rest of the body. Keep him warm and quiet. A hot-water bottle over the abdomen and firm hand pressure on the muscles of the limbs may help to relieve the cramps. Give stimulants and sips of salt water (a teaspoonful to a pint of tepid water).

HEAT EXHAUSTION

Heat exhaustion results from prolonged exposure to intense heat, either indoors or outdoors. The signs and symptoms are different from those of heatstroke although the cause of the two conditions may be the same.

Signs and Symptoms. The face is pale, the skin cold and moist, the breathing rapid and shallow, and the pulse rapid and weak. The body temperature may be below normal or slightly above normal. Ordinarily the victim is conscious. If he faints, he usually gains consciousness quickly.

What to Do. Have the victim lie down in a cool, quiet place. Loosen his clothing. If he complains of feeling cold cover him with a blanket or a coat. If conscious, give him a stimulant—tea, coffee, or aromatic spirits of ammonia (one-half teaspoonful in one-half glass of water) and sips of

tepid salt water (one teaspoonful of salt to a pint of water). Call a physician if the victim does not feel better soon.

HEATSTROKE AND SUNSTROKE

Heatstroke and sunstroke have the same effect on the body. In referring to this particular effect of heat, however, it is customary to speak of heatstroke as the result of exposure to intense heat indoors and of sunstroke as the result of prolonged exposure to the direct rays of the sun out-of-doors.

Signs and Symptoms. Danger signals are dizziness, nausea, and pain in the head. In true heatstroke or sunstroke these symptoms are rapidly followed by unconsciousness. The skin is hot and dry; the face is red or purple; breathing is difficult; the pulse is rapid, and the temperature very high.

What to Do. Call a doctor. Remove the victim to a cool, shady place. Take off as much of his clothing as possible and lay him on his back with his head and shoulders raised slightly. Apply an ice bag or cloths wrung out of cold water (iced if possible) to his head. Then work to reduce his temperature (1) by wrapping him in a sheet kept wet by pouring or spraying on cold water every few minutes, or (2) by placing him in a cool bath for about twenty minutes, or (3) by applying cold wet cloths or ice bags to his neck, chest, and armpits as well as to his head.

After consciousness returns, give the victim cool drinks. *Do not give stimulants,* as they serve to increase the production of body heat by speeding up body activities. Further treatment should be given by a physician.

HEMORRHAGE, EXTERNAL. *See* Bleeding, How to Stop It.
See also Bleeding, pages 73-84, Part II.
HEMORRHAGE, INTERNAL. *See under* Bleeding, pages 84-85, Part II.
HEMORRHAGE, NOSE. *See* Nosebleed.

HEMORRHOIDS (PILES)

Hemorrhoids are due to a varicose state of the veins about the anus, the outlet at the lower end of the rectum through which food wastes are eliminated. The blood vessels involved have become enlarged, swollen, and congested. Hemorrhoids may come on suddenly after severe straining at stool or other unusual effort (childbirth, for instance).

Signs and Symptoms. Pain, burning, and sometimes itching and bleeding are present. The varicose condition may be internal (above the anal sphincter) or below the sphincter, producing external hemorrhoids.

What to Do. It is important to see a physician promptly, not only to care for the hemorrhoids, but also to make sure that other conditions more serious in character are not present, such as abscess, fissure, or possibly a malignant growth.

The emergency care, if no physician is available and if external hemorrhoids are formed, is to attempt their manual replacement with a simple lubricant, such as vaseline. Suppositories, especially prepared for hemorrhoids, will also be found useful. If the condition is entirely internal, the use of suppositories for a period of several days may allay the disturbing symptoms. However, a physician should be consulted concerning the more effective and permanent care of the hemorrhoids, either by injection or operative removal.

HERNIA (RUPTURE)

A hernia or rupture is the bulging of a loop of bowel or some other portion of the abdominal contents through a previously existing weak spot in the inner wall of the abdomen, the external skin usually remaining unbroken. Most hernias are inguinal (in the groin). Occasionally ruptures may occur at the navel (umbilical hernias). Muscular strain from heavy lifting, violent coughing as in whooping cough,

jumping, and so on may immediately precede a rupture.

In simple hernia the protruding organ readily slips back into the abdominal cavity when the victim lies down. A hernia is said to be strangulated when the protruding organ cannot be replaced.

Signs and Symptoms. A swelling appears in the abdomen at the site of the rupture—in the groin on either side, or at the navel. Usually there is severe abdominal pain.

What to Do. In case of a sudden attack, call a doctor. Lay the victim on his back. Raise his buttocks with two pillows and bend his knees so that the abdomen is made lax. In simple hernia the loop of bowel may then slip back into place of its own accord. The application of cold compresses may help, as cold tends to prevent the congestion of blood in the swollen area and so makes it easier for the loop of bowel to slip into place. It is necessary to call a physician because every rupture carries a risk of strangulation, and even a simple hernia may have serious complications.

HICCOUGH

Hiccough usually is caused by the spasmodic involuntary contraction of the diaphragm, the great breathing muscle which separates the chest from the abdomen.

Air drawn into the windpipe in quick jerks instead of smoothly and evenly as in normal breathing produces the peculiar clicking sound of hiccoughs. Indigestion, overeating, riotous laughter, alcoholic drinks, and sometimes pure nervousness may bring on an attack.

What to Do. Hiccoughs are arrested by breaking the diaphragm of its suddenly acquired habit of contracting spasmodically. Usually this may be done by holding the breath as long as possible because the air in the chest forces the diaphragm down so that it does not contract. Slowly drinking a small glass of water while holding the breath has the same effect. A sudden fright occasionally stops hiccoughs because it makes the victim take a long breath. Breathing

with a paper bag held tightly over the mouth and nose may stop hiccoughs by means of the carbon dioxide accumulated in the bag. If hiccough persists in spite of all efforts to stop it, consult a physician.

HIP INJURIES, BANDAGES FOR. *See under* Bandaging, page 107.
DISLOCATED HIP. *See under* Dislocations, page 161.
FRACTURE, PELVIS. *See under* Fractures, page 211.
FRACTURE, THIGH. *See under* Fractures, page 202.

HIVES (UTICARIA)

Hives is the popular term used to describe the sudden eruption of small elevated patches or "bumps" on the skin. Hives are usually whiter than the surrounding skin and itch intensely.

Cause. Most cases of hives are caused by a sensitivity to a certain food or foods. For example a person may not be able to eat sea food or certain fruits, vegetables, or nuts without breaking out with hives. A serum injection also may cause hives if the person is sensitive to the animal serum used.

In addition to, or instead of, hives, the skin symptoms shown by a person who is sensitive to a certain food or foods may include swelling, either general or local, itching of the skin, redness, and eczema.

What to Do. The only hope of getting permanently rid of hives is to consult a physician. By making certain tests he can usually identify the offending food or foods. He may then advise the patient to give up eating the food or raise the patient's tolerance to it by administering it in very small doses which are gradually increased.

If a severe attack of hives breaks out within an hour or so after eating a food suspected of causing them, it will help to induce vomiting by giving an emetic. Then give a cathartic, such as Epsom salts. To relieve the itching apply calamine lotion or a strong solution of bicarbonate of soda.

HORNET STINGS. *See under* Bites, Insect, page 125.
HYDROCYANIC-ACID POISONING. *See* Poison Table, Cyanides, page 256.
HYDROCYANIC-ACID GAS (a systemic poison gas which may be used in chemical warfare). *See under* War Injuries, page 344.
HYDROFLUORIC-ACID POISONING. *See* Poison Table, Fluorides, page 257.
HYDROPHOBIA. *See* Rabies *under* Bites, Animal, page 123.

HYSTERIA

Hysteria, or "hysterics," is the name given to the nervous fits which occur in some neurotic, high-strung individuals, particularly young women, who have poor self-control. Occasionally a well-balanced person under great strain will have an attack of hysteria. An hysterical seizure seldom takes place unless spectators are present.

Signs and Symptoms. Hysteria may manifest itself in a great variety of ways, ranging from uncontrollable crying or laughing spells to convulsions which closely resemble those of true epilepsy followed by unconsciousness. An hysterical fit may be distinguished from an epileptic fit by the following signs: The person always chooses a comfortable soft spot, like a divan or easy chair, on which to fall "unconscious," and her face does not change color. The fact that she is not really unconscious may be proved by trying to pull open her eyelids. In true hysteria the person affected will usually resist by forcibly holding the eyelids shut.

What to Do. Do not act solicitous, as this will prolong the attack. Remember that the person has lost self-control and must be treated with firmness. Throw a cup of cold water in her face or hold a strong ammonia inhalant quite close to her nose. Frequently a firm command to stop brings results if a person is laughing or crying uncontrollably. Perhaps the best thing to do, if it seems advisable, is

to leave an hysterical person alone. As soon as her "audience" disappears she is apt to "come to."

Since hysteria is usually a symptom of some sort of nervous or mental maladjustment, its victims should not be blamed or held up to ridicule. If attacks persist, the victim should consult a physician, who may advise care by a specialist in nervous diseases.

I

ICE ACCIDENTS

Rescue. Before going to the rescue of someone who has broken through the ice, arrange for your own rescue, if possible, by tying around your body one end of a rope or articles of clothing tied firmly together and have the other end fastened or held on shore. If a ladder or plank can be obtained, crawl toward the victim with it under you so that your weight is supported on it or push it ahead of you until the victim can reach it. If a board or ladder is not available, crawl, *do not walk or skate,* toward the victim. Thin ice will better support body weight when it is spread out as in crawling on the belly (not on hands or knees) than when it is centered on a small area, as in standing up. A pole, a tree branch, a rope in which a small stick or knot has been tied—in fact, anything which may be shoved or thrown within reach of the victim—will make it unnecessary to go too close to the rotten or thin ice near the hole. In returning to shore, both rescuer and victim should crawl on their bellies until firm ice is reached.

The victim of an ice accident can greatly aid his rescuer and, if alone, stand a good chance of saving his own life if he can keep calm enough to do the following things:

1. Extend both arms on the surface of the ice and kick the legs as in swimming the crawl stroke (Figure 73). This will help to prevent excessive chilling and will

allow the water to support part of the weight of the body and hold it in a flat position.

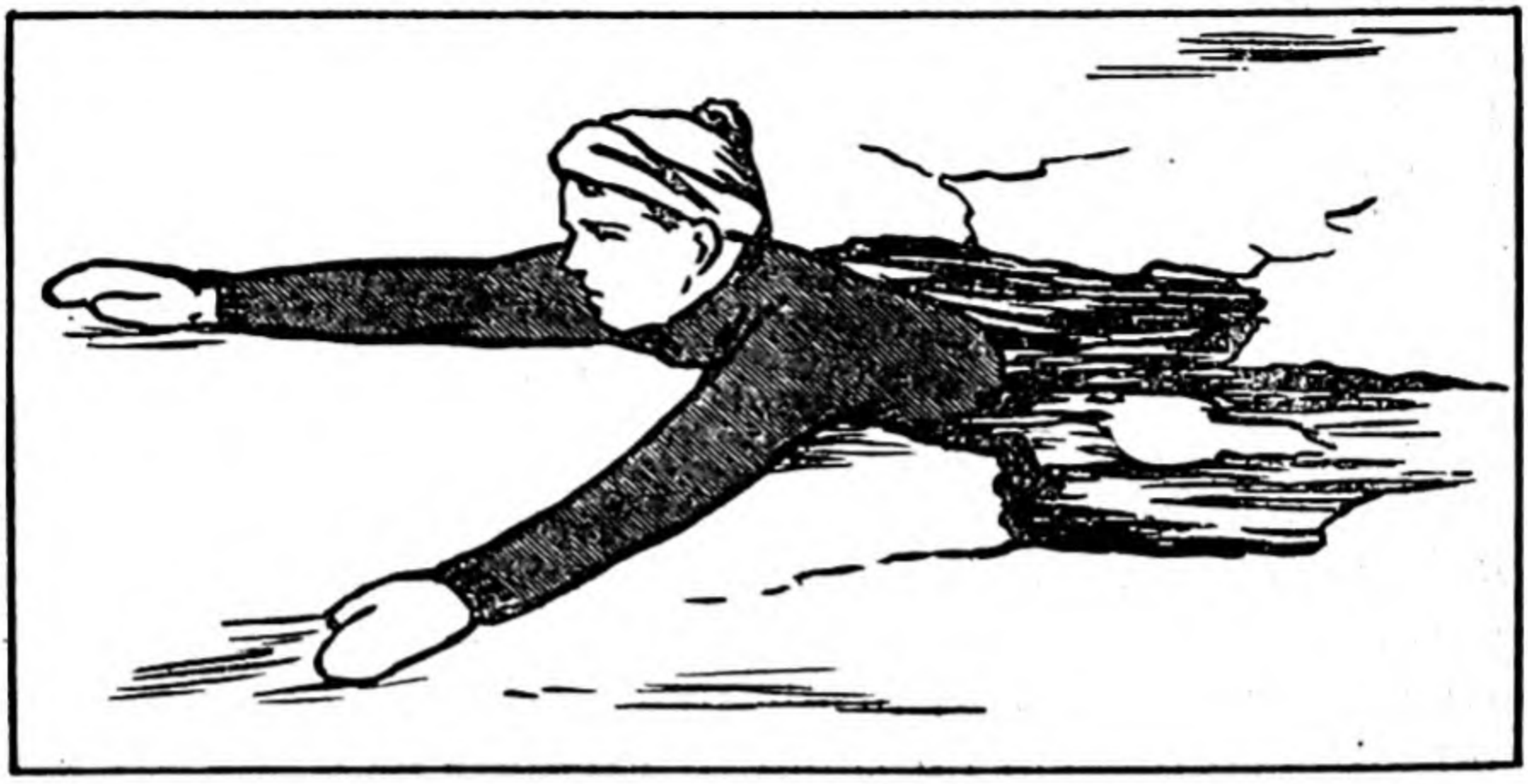


Figure 73

2. Lying flat, crawl forward on the stomach until the hips are at the edge of the hole. A pointed object, such as a large nail, knife, or the heel of a skate will help to obtain pulling purchase on the ice (Figure 74).

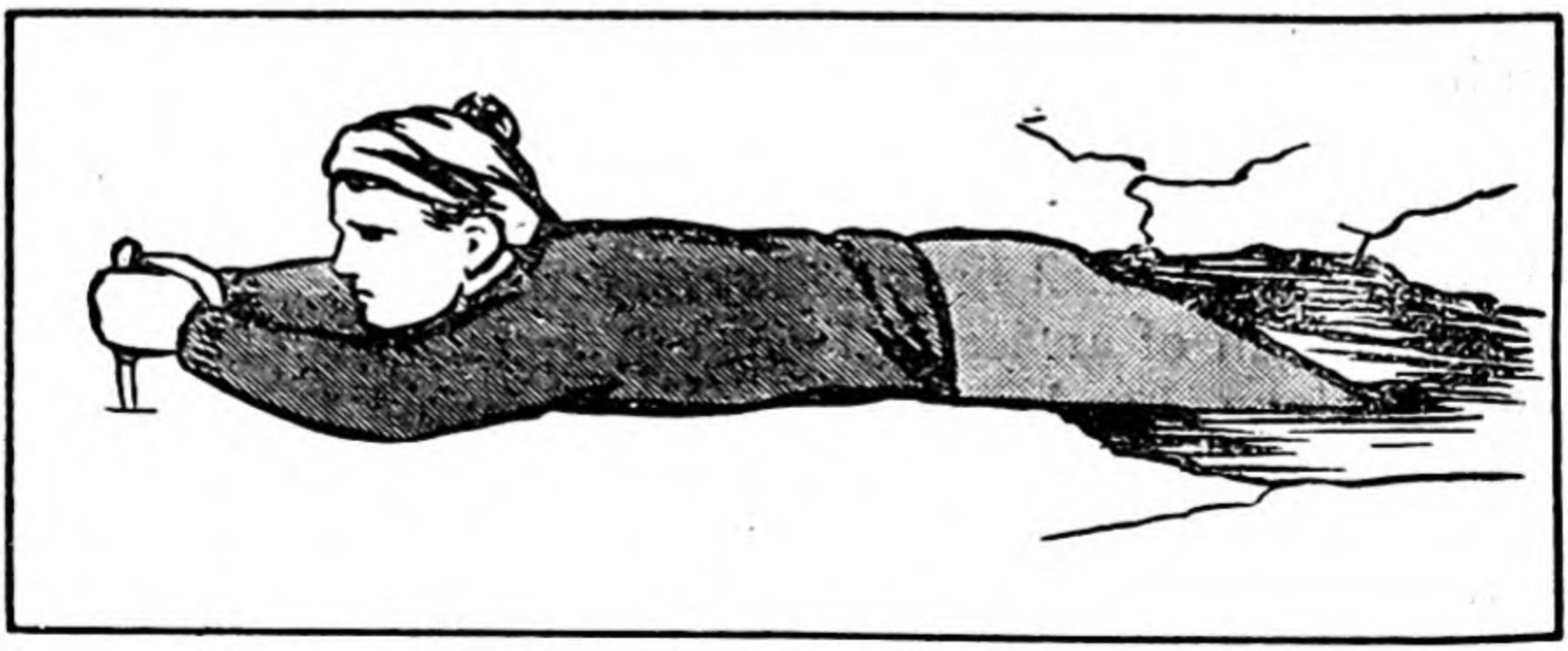


Figure 74

3. Swing the body quickly sideways with the arms extended above the head and roll away from the broken edge (Figure 75).

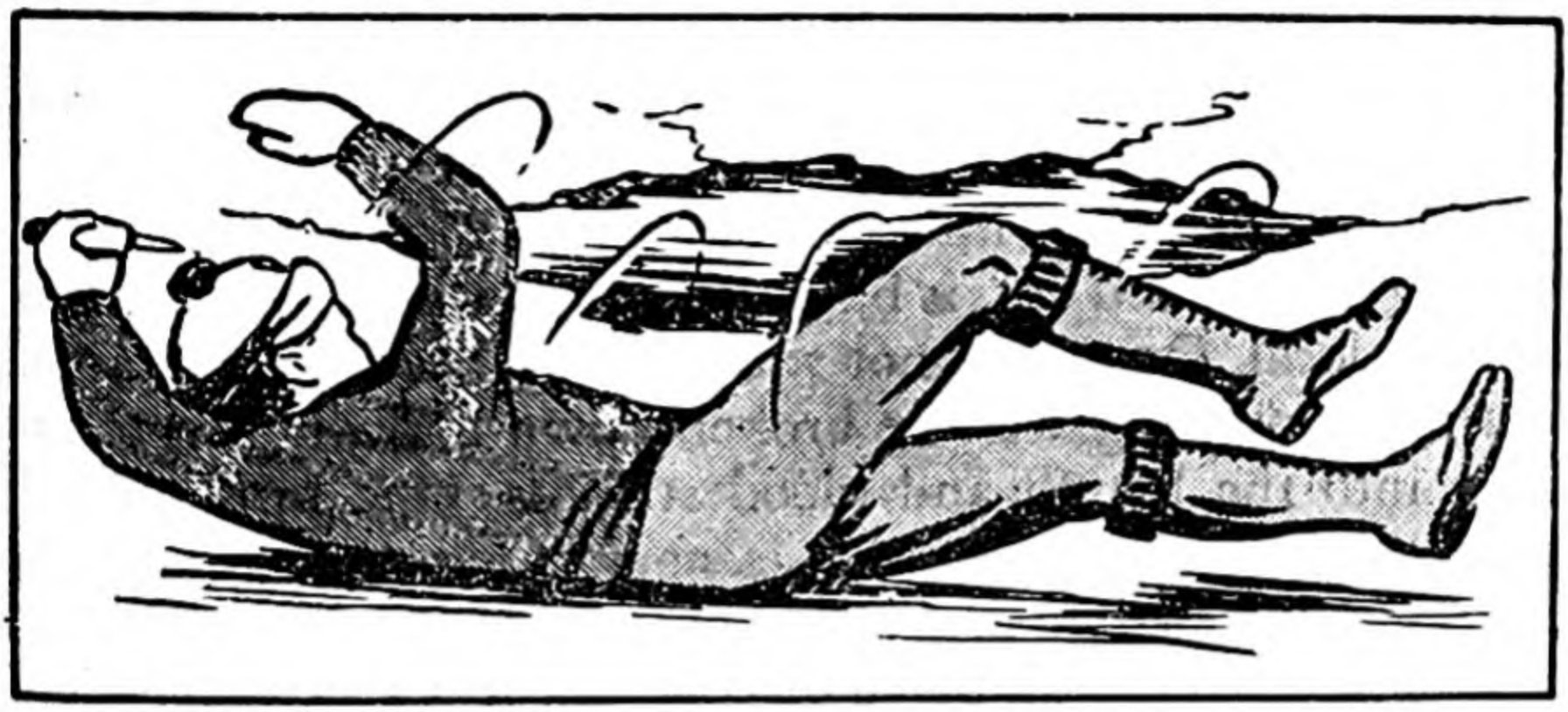


Figure 75

4. Continue to crawl until firm ice is reached.

What to Do After Rescue. The victim will probably be blue with cold. His breathing may or may not have stopped. If he is not breathing, start artificial respiration at once. At the earliest possible moment get the victim dry and warm. Cut or tear off his wet clothing, place coats or blankets under and over him, apply hot-water bottles or hot stones wrapped in cloth or newspapers, and give him warm, stimulating drinks as soon as he is able to swallow.

INCENDIARY BOMBS, HOW TO EXTINGUISH. *See* Appendix, pages 350-354.

INFECTION

Infection is the condition brought about in the body by the activities of germs which have entered it from without. The portal of entry may be the mouth, nose, or some other natural body opening or a break in the continuity of the

skin or mucous membrane. Infection may be divided into two large classes—local infection and general infection.

Local Infection. In a local infection the germs are confined to one limited area of the body. In a pimple, for example, the embattled cells can usually wall off the field of attack while the wandering germ-eating cells of the body, the phagocytes, "mop up" the invaders.

The care of a local infection of any kind, such as a simple boil or an infected cut, is based on the measures required to keep it local. One must not squeeze a pimple, for example, lest the protecting wall be broken down and the germs escape into the lymph and blood streams. One must guard against further infection, that is, against letting more germs into the infected area by touching it with dirty fingers, sneezing or coughing on it, or covering it with cloth which is not sterile. If a local infection does not clear up quickly after painting it once or twice with a 2% tincture of iodine and protecting it with a sterile compress, a physician should be consulted. See also Wound Infection under Wounds, page 315.

General Infection. In a general infection, the invading germs first start colonies in a part of the body where the living conditions are best suited to their needs. If nothing happens to increase the death rate or decrease the birth rate of the germ population, it finally grows large enough to manufacture and ship via the blood stream the toxins (poisons) which produce the symptoms of the disease caused by that particular breed of germs. Thus diphtheria bacilli lodging in the throat, pneumococci settling in the lungs, tetanus bacilli lurking in the depths of a puncture wound, and typhoid bacilli colonizing in the intestines make and pour into the blood the toxins which produce the symptoms respectively of diphtheria, pneumonia, tetanus, and typhoid fever. The period starting with the entry of germs into the body and ending with the first appearance of symptoms

of the disease those germs cause is the incubation period.

Anyone ill with a general infection should be under the care of a physician. It is impossible for a layman to assign the correct cause to the various signs and symptoms, such as chilliness, fever, nausea, or "feeling sick," which mark the onset of a general infection. Getting down to the exact cause of the symptoms—stating, "this person has scarlet fever and not measles" or "pneumonia and not just a bad cold"—is called making a diagnosis. On the diagnosis the physician bases his treatment. That treatment, for many of the common general infections, now stands a very good chance of succeeding because of the tremendous increase during recent years in the lifesaving resources of medical science. Drugs of the sulfonamide group that work against germs of the coccus family (for example, those which cause pneumonia, gonorrhea, streptococcal blood poisoning, epidemic cerebrospinal meningitis, and childbed fever); antitoxic or antibacterial serums of various kinds which work against the toxin produced by the germs (for example, diphtheria antitoxin and tetanus antitoxin) or against the germs themselves (for example, antipneumococcic serum) so that the regular defense forces of the body can destroy them; all these and many other weapons are now available for fighting general infections. But the right remedy—the one likely to work—can only be chosen and prescribed in the correct dosage by a physician on the basis of a correct diagnosis. That is one reason why "call your doctor" is the theme song of all sound advice given to laymen on the subject of disease.

INFECTION, WOUND. *See* Wound Infection, pages 315-317.
INSECT BITES AND STINGS. *See* Bites, Insect.
INSECT-POWDER POISONING. *See* Poison Table, Arsenic, page 252, Fluorides, page 257.
INTERNAL BLEEDING. *See under* Bleeding, Part II, pages 84-85.

INTERNAL INJURIES

In the absence of external evidence as to the nature or extent of an accidental injury, internal injury should always be suspected. The only symptoms may be those of severe shock—weakness, pallor, and a weak shallow pulse. The victim may or may not be unconscious.

Keep the injured person lying down, warm, and quiet. Do not give him a stimulant. Get a physician as quickly as possible. If the victim must be moved, transport him in a lying position.

If circumstances suggest the nature of the injury—for example, a fall or blow on the head or back, or squeezing or crushing of the chest or pelvic region, and so on—see under the appropriate heading.

INTESTINES, BLEEDING FROM. *See under* Internal Bleeding, page 84.
INTOXICATION. *See* Alcoholism.
IODINE POISONING. *See* Poison Table, page 258.
IRRITANTS, POISONING FROM. *See under* Chemical Poisons Swallowed, page 90.
IVY POISONING. *See* Poison Ivy.

J

JAW, DISLOCATION OF. *See under* Dislocations, page 162.
FRACTURE OF. *See under* Fractures, page 209.
JOINTS, BANDAGES FOR. *See under* Bandaging; Elbow, page 110; Knee, page 110. *See under* Sprains, Sprained Ankle Bandage, page 270.
DISLOCATION OF. *See* Dislocations.
FRACTURE OF. *See* Fracture Table, Ankle, page 199; Elbow, page 192; Jaw, page 209; Kneecap, page 201; Wrist, page 191.
SPRAIN OF. *See* Sprains.

K

KEROSENE POISONING. *See* Poison Table, Petroleum Distillates, page 262.
KITS, FIRST AID. *See* pages 41-42.
KNEE, BANDAGE FOR. *See* Bandaging, page 110.
FRACTURE OF. *See under* Fractures, page 201.

L

LACERATED WOUNDS. *See under* Wounds, page 315.
LARKSPUR SEEDS SWALLOWED. *See* Poison Table, Aconite, page 251.
LAUDANUM POISONING. *See* Poison Table, Opium, page 260.
LEAD POISONING. *See* Poison Table, Lead Compounds, page 259.
LEG, BANDAGE FOR. *See* Bandaging, page 108.
BLEEDING FROM. *See* Bleeding, How to Stop It, page 134.
FRACTURE OF. *See under* Fractures, page 205, for traction-fixation splints; *under* Fractures, page 199, for ordinary splints.
LEWISITE (a skin-blistering gas used in chemical warfare). *See under* War Injuries, page 340.

LIGHTNING

A person struck by lightning should be treated as a case of electric shock. *See* Electric Shock.

LIME, CAUSTIC, POISONING. *See* Poison Table, Alkalis, Caustic, page 251.
LITHARGE (Lead Oxide) POISONING. *See* Poison Table, Lead Compounds, page 259.
LOBELIA POISONING. *See* Poison Table, Nicotine, page 260.
LOCKJAW. *See* Tetanus.
LUMINAL POISONING. *See* Poison Table, Barbiturates, page 253.

LUNGS, BLEEDING FROM. *See* Internal Bleeding, page 84, and Ribs, Fracture of, page 212.
LYE POISONING. *See* Poison Table, Alkalis, Caustic, page 251.
LYSOL POISONING. *See* Poison Table, Carbolic Acid, page 254.

M

MAGNESIUM BOMBS (incendiary bombs used in warfare), HOW TO EXTINGUISH. *See* Appendix, pages 352-353.
MALARIA. *See* Mosquito Bite under Bites, Insect, page 125.
MATCH HEADS, POISONING FROM. *See* Poison Table, Phosphorus, page 262.
MERCURY-BICHLORIDE POISONING. *See* Poison Table, page 259.
METHYL-ALCOHOL (Wood Alcohol) POISONING. *See* Poison Table, Alcohol, Methyl, page 251.
MONKSHOOD, EATEN. *See* Poison Table, Aconite, page 251.
MORPHINE POISONING. *See* Poison Table, Opium, page 260.
MOSQUITO BITES. *See under* Bites, Insect, page 125.
MOVING THE INJURED. *See* Transportation of the Injured.
MUSCLE STRAIN. *See* Strains.
MUSHROOM POISONING. *See* Poison Table, page 260.
MUSTARD GAS (a skin-blistering gas used in chemical warfare). *See under* War Injuries, page 337-340.

N

NAILS, WOUNDS CAUSED BY. *See under* Punctured Wounds, page 319. *See also* Tetanus.
NAPHTHA, SWALLOWED. *See* Poison Table, Petroleum Distillates, page 262.
INHALED. *See* Gasoline, Benzine, and Naphtha Fumes Inhaled, page 222.
NARCOTICS, POISONING FROM. *See under* Chemical Poisons Swallowed, Part II, page 91.
NEUROTIC IRRITANTS, POISONING FROM. *See under* Chemical Poisons Swallowed, Part II, page 91.
NICOTINE POISONING. *See* Poison Table, page 260.

NIGHTSHADE BERRIES EATEN. *See* Poison Table, Atropine, page 253.

NITRIC-ACID POISONING. *See* Poison Table, Alkalis, Caustic, page 251.

NOSEBLEED

Bleeding from the nose often occurs without apparent cause, particularly in children. In old people it may be a sign of high blood pressure. A blow on the nose is very likely to cause nosebleed. Slight nosebleed does no particular harm and usually stops of its own accord. If bleeding is severe or continues in spite of all efforts to stop it, call a physician at once.

What to Do. Press the nostrils firmly together for four or five minutes. This may stop the bleeding by giving an opportunity for a clot to form over the ruptured blood vessels. Pushing a little pad of tissue paper or a roll of soft cloth under the upper lip and then pressing firmly with the forefinger laid along the lip also may stop an ordinary nosebleed. The pressure on the upper lip compresses the anterior (toward the front) blood vessels of the nose, which usually are the source of the bleeding.

If either of these measures do not stop the nosebleed in a few minutes, put the person in a chair and apply cloths wrung out of cold water over his nose. Instruct the person not to blow his nose for a few hours after the bleeding has stopped so as to avoid dislodging the clot.

In severe nosebleed, while waiting for the physician, plug the nostril with sterile cotton or a narrow strip of sterile gauze. Leave one end of the plug outside the nostril so that it can be removed easily. Do not insert the plug further than the finger can push it.

NOSE, FOREIGN BODY IN

If any small foreign body like a button, bean, or insect is lodged in the nose where it can be seen, it can usually be

removed without much trouble. The nose should not be blown forcibly. If the object cannot be extracted at the first attempt, take the victim to a physician.

NUX-VOMICA POISONING. *See* Poison Table, Strychnine, page 265.

O

OAK POISONING. *See* Poison Oak.
OPIUM POISONING. *See* Poison Table, page 260.
OTITIS MEDIA. *See* Earache, page 167.
OXALIC-ACID POISONING. *See* Poison Table, Acids, page 250.

P

PAIN-RELIEVING DRUGS, POISONING FROM. *See* Poison Table, pages 261-262.
PARALYTIC STROKE. *See* Apoplexy.
PAREGORIC POISONING. *See* Poison Table, Opium, page 260.
PARIS-GREEN POISONING. *See* Poison Table, Arsenic, page 252.
PELVIS, FRACTUGE OF. *See under* Fractures, page 211.
PENETRATING WOUNDS. *See* Punctured Wounds under Wounds, page 319.
PERFORATING WOUNDS. *See* Punctured Wounds under Wounds, page 319.
PETROLEUM DISTILLATES, SWALLOWED. *See* Poison Table, page 262.
FUMES INHALED. *See* Gasoline, Benzine, and Naphtha, Fumes Inhaled, page 222.
PHENACETIN POISONING. *See* Poison Table, Acetanilid, page 250.
PHENOBARBITAL POISONING. *See* Poison Table, Barbiturates, page 253.
PHENOL POISONING. *See* Poison Table, Carbolic Acid, page 254.
PHOSGENE (a lung-irritant gas used in chemical warfare). *See under* War Injuries, page 334.

PHOSPHORUS POISONING. *See* Poison Table, page 262.
PHOSPHORUS, WHITE, BURNS FROM. *See under* War Injuries, page 329.
INCENDIARY BOMBS, HOW TO EXTINGUISH. *See* Appendix, pages 350-354.
PILES. *See* Hemorrhoids.

PINCHING OF FINGERS

Pinching a finger in closing a door, window, or drawer or while using tools is apt to raise a blood blister. This means that the capillaries in the true skin, or derma, under the epidermis have been injured. First aid is the same as for any other blister. See Blisters.

PINKEYE (conjunctivitis). *See* Eye, Infections of, page 175.

POISON IVY
POISON OAK
POISON SUMAC

These three poisonous plants, all members of the *Rhus* family, cause dermatitis (skin inflammation) in susceptible persons.

Poison ivy (common east of the Rocky Mountains) may grow as an erect bush three or four feet high, as a vine which attaches itself to trees and poles, or as a shrub which trails along the ground or over fences and stone walls. The compound shiny green leaves (Figure 76), which are rather broad with irregularly cut edges, are always arranged on a stalk in characteristic groups of three leaflets. Two leaflets with short stems are opposite each other on the stalk and the third leaflet is at the end of the stalk. "Leaves three; let it be!" is a warning that should be heeded by everyone who walks or works in the woods and fields. In the late fall and winter, poison ivy may be recognized by its clusters of small, waxy grayish-white berries which look very much like bayberries.

Poison oak (common on the Pacific Coast) may be found

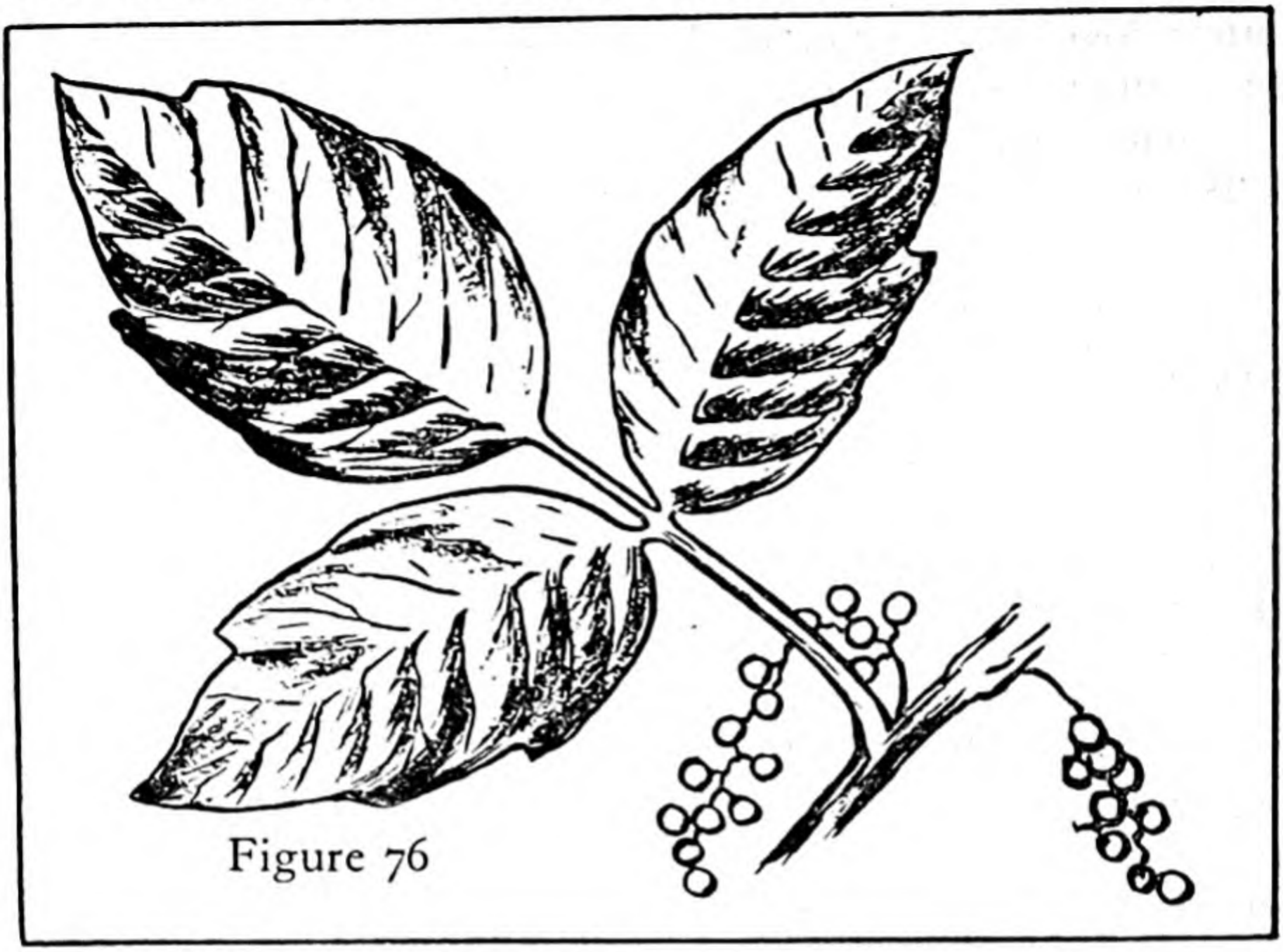


Figure 76

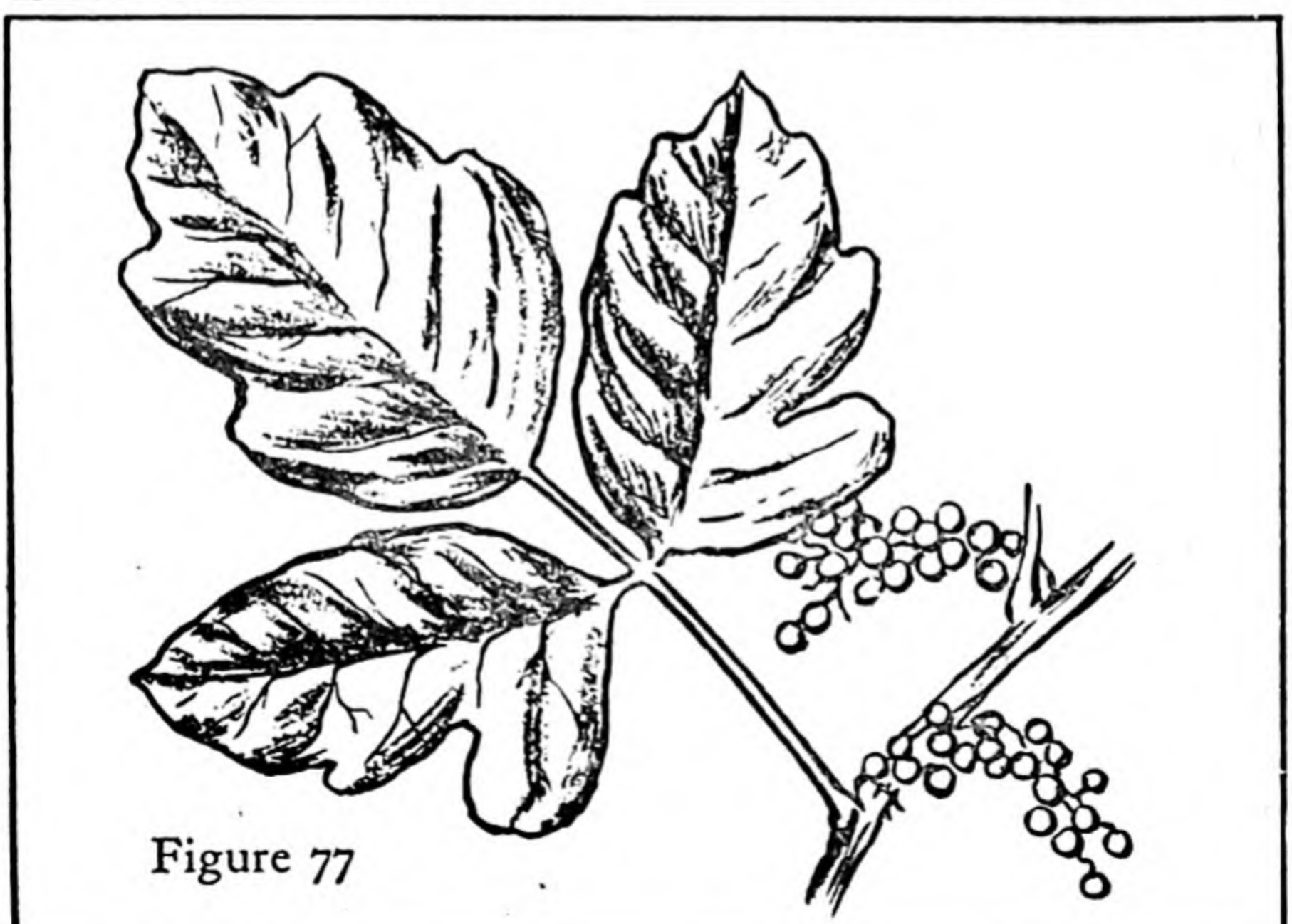


Figure 77

as a climbing vine, but usually grows as a bush from four to eight feet high, with leaves, somewhat like oak leaves, arranged in groups of three leaflets (Figure 77).

Poison sumac, also known as swamp sumac, poison ash, poison dogwood, poison elder, and thunderwood, grows in swamps and wet ground as a shrub with slender stems or as a tree with a trunk from five to ten inches in diameter. The shrub may grow as high as ten feet; the tree may reach a height of from twenty to thirty feet. The compound leaves are arranged in pairs of leaflets along a stem with a single leaflet at the end (Figure 78). The berries, which grow in

Figure 78

loose clusters from three to eight inches long, are cream-colored and waxy like mistletoe and remain on the stems

throughout the winter. The berries of nonpoisonous sumac are a rusty red.

The poison of all three plants is an oily substance related to phenol (carbolic acid). It is present in the milky sap and is found in all parts of the plant. Skin poisoning is caused by touching the plant or by handling anything which has been in contact with it. The oil in the sap evaporates so slowly that a person may be poisoned in the spring by using contaminated tools put away the preceding fall. Many people have been poisoned by removing clothes or unlacing shoes which have brushed against the plant or by petting a dog or cat which has taken a trip through a patch of poison ivy. Standing in the smoke from a brush fire in which poison ivy is burning will cause poisoning because the smoke particles carry droplets of the oil.

Some persons "do not take poison ivy" (or poison oak) by ordinary handling of the plant, while others may be extremely susceptible. Although it is true that some people are more sensitive than others, nobody is completely immune. After years of handling the plant unscathed, a person may suddenly fall victim to the poison. Most people are more sensitive at one time than another; poisoning is most apt to occur when the skin is damp with perspiration.

Prevention Before Exposure. The only sure way to avoid ivy, oak, or sumac poisoning is to learn to recognize the plants and keep away from them. Too few people have acquired a wholesome respect for these "Borgias" of the woods and boglands. But remember—a severe case of poisoning can put you in the hospital for a month.

A few years ago physicians had high hopes that a toxin extracted from poison-ivy leaves might be effective in protecting persons from ivy poisoning. Administration of the extract in the spring does protect some people throughout the summer but in others causes a worse case of poisoning than would be likely to occur by touching the plant.

Recently doctors of the U. S. Public Health Service have

developed a protective ointment to be used by persons who must work where poison ivy grows. It consists of an ointment containing 10% of finely powdered sodium perborate. Two formulas for preparing this ointment are given in *Public Health Reports,* Vol. 57, No. 16, April 17, 1942 (Superintendent of Documents, Washington, D. C. Price 5 cents). Any druggist can make this preparation. The protective ointment should be liberally smeared on all skin surfaces likely to come in contact with poison ivy—the hands, especially between the fingers, the forearms, the face, and the ankles. After four hours, or when the worker stops for lunch, the ointment should be washed off with soap and water. Then before returning to the fields or woods it should be applied again and washed off at the end of the day's work.

The protective ointment fills the pores of the skin, thus forming a protective covering which keeps much of the poison oil from penetrating. As perspiration comes in contact with the cream a soap is formed and the alkalinity of the soap liberates oxygen from the sodium perborate. This oxygen destroys the poison. After the ointment has been removed, care should be taken not to let the skin come in contact with contaminated tools or clothing. The person using the ointment should not purposely or unduly expose himself to poison ivy, because if more of the poison comes in contact with the skin than can be oxidized by the sodium perborate, dermatitis may result.

Prevention After Exposure. It takes from fifteen to thirty minutes for the irritant poison of poison ivy, poison oak, or poison sumac to penetrate the outer layers of the skin. If the skin is thoroughly washed with soap and water before this happens, poisoning may often be avoided. Work up a good lather and wash and rinse the exposed skin areas several times. Do not use a brush, as this irritates the skin and hence facilitates the penetration of the poison. After the final rinse with clear water, dry, and apply rubbing alcohol.

Another method of removing the poison which some people have found more effective than washing only with soap and water is to wash first with a solution of trisodium phosphate (Oakite cleaning powder) in the proportion of one teaspoonful to a quart (small basin) of warm water. The trisodium phosphate "cuts" the oily sap which carries the poison. The skin is then washed with soap and water and rinsed with clear water.

Signs and Symptoms of Poisoning. Once the poison has penetrated the outer layers of the skin, violent itching, burning, redness, and swelling will occur in from a few hours to a few days, depending upon the susceptibility of the victim. An eruption of small blisters soon follows. The small blisters may unite to form large ones. When the blisters break, a watery serum exudes. This serum, contrary to the popular notion, does not contain the poison and will not spread the dermatitis. In severe cases, fever may be present.

What to Do. Wash the red itching spots with soap and water and then with 70% alcohol when they first appear. Any one of the following methods may then be tried for the relief of the victim:

1. Swab the spots with 5% ferric-chloride solution obtained from your druggist. Dilute the solution by about one half before applying it around the eyes. The yellow stain left by the solution can be removed with lemon juice.

2. Apply a dressing wet with a strong solution of Epsom salts or sodium bicarbonate (baking soda) in cold water. Keep the dressing wet.

3. Apply a thick soap paste made by heating soap with a little water until the mixture is about the consistency of lard. Allow the paste to dry and leave it on overnight.

4. Apply calamine lotion to which enough carbolic acid has been added at the drugstore to make a 2% solution. Shake the bottle well before using. Dab on the solution with a gauze or cotton sponge and allow it to dry.

When the blisters are large, puncture them at the side

with a sterile needle and gently press out the contents with sterile gauze. Then apply a dressing soaked in a cold sodium-bicarbonate solution or moisten the area with a 5% solution of potassium permanganate (one and a half tablespoonfuls of potassium-permanganate crystals in one pint of water). Potassium permanganate releases oxygen when it comes in contact with the tissues. As the poison of poison ivy is detoxified by oxidation, potassium permanganate has been recommended for the treatment of poison ivy by various authorities.

In case of severe ivy poisoning, see a physician.

POISONS INHALED, CARBON MONOXIDE. *See* Gas Asphyxiation.

GASOLINE, BENZINE, AND NAPHTHA FUMES INHALED. *See* page 222.

WAR GASES. *See* War Injuries, pages 330-349.

POISONS SWALLOWED

When someone has swallowed a poison, it may be possible to find out what it was from an examination of the surroundings or from what the victim tells you. But *do not lose* time trying to discover what the poison was. Every moment of delay means that more and more of it is being absorbed into the system. Call a physician at once and, while waiting for him, dilute the poison and wash out the stomach by giving an emetic a glassful at a time, until the fluid vomited is clear. Tickle the back of the victim's throat with the finger or a feather if the victim has not vomited after swallowing several glassfuls of the emetic.

If you know what poison was swallowed, look it up in the Poison Table, pages 250-266, which is alphabetically arranged, and follow the directions for first aid.

In all cases, whether the poison is known or not known, remember to keep the victim warm and quiet after everything possible has been done to remove or counteract it. A demulcent (soothing drink), such as the whites of two

or three raw eggs in a little water, one or two glasses of milk, or a thin soup of starch or flour and water, should be given if the victim can swallow. A stimulating drink, such as hot coffee or tea, may be helpful. If the victim has stopped breathing, give artificial respiration at once (see pages 67-70).

POISON TABLE

Antidotes, Demulcents, Emetics, Stimulants (with dosages), and Other Supplies

Aromatic spirits of ammonia, one half teaspoonful in one half glass of water (stimulant)
Baking soda, *see* Sodium bicarbonate
Charcoal, activated or animal, powdered, one tablespoonful in water (adsorbent in strychnine poisoning)
Coffee, strong, black, hot (stimulant)
Copper sulphate (blue vitriol, powdered), three grains (a scant penknife-pointful) in a glass of water (phosphorus poisoning)
Egg whites, raw, from three to five mixed with a little water (demulcent, mercury-bichloride antidote)
Epsom salts, one tablespoonful to a glass of water (saline laxative, carbolic-acid antidote)
Flour, raw, mixed with water to make a thin soup (demulcent drink)
Hot-water bottle, for applying external heat as a supportive measure
Ice bag
Lemon juice, juice of four lemons to a pint of water (caustic-alkali antidote)
Magnesia, milk of, one teacupful in a pint of water (acid antidote); one tablespoonful in water (laxative)
Milk, one or two glasses (demulcent drink)
Mustard, one teaspoonful in a glass of warm water (emetic)

Olive oil, one wineglassful (demulcent in acid and caustic-alkali poisoning. *Do not use* in carbolic-acid and phosphorus poisoning)
Potassium-permanganate crystals, four grains (a penknife-pointful) in a pint of water (oxidizing agent, antidote for certain organic poisons)
Salt, ordinary table, one tablespoonful in a glass of warm water (emetic)
Sodium bicarbonate, one tablespoonful to a glass of water (acid antidote); one quarter teaspoonful in water (average dose as antacid)
Soap, shaken up in warm water to make a good suds (emetic, acid antidote)
Starch, raw, mixed with water to make a thin soup (demulcent)
Tannic-acid powder, from one quarter to one teaspoonful in water (precipitant, antidote for several metallic and alkaloid poisons)
Tea, strong, a substitute for tannic acid
Vinegar, one wineglassful in a pint of water (caustic-alkali antidote)

POISON TABLE

Unless Otherwise Specified

Emetic = Warm mustard water, warm salt water, or warm soapy water administered repeatedly until fluid coming from stomach is clear
Demulcent drinks = Milk, milk and eggs beaten up together, raw egg whites in water, or a thin soup of flour or starch in water
Stimulants = Aromatic spirits of ammonia or sweetened, hot, strong, black coffee
Supportive Measures = Warmth (blankets to conserve body heat), recumbent position, quiet

POISON TABLE

Poison	*Means of Recognition*	*What to Do*
Acetanilid Used to relieve pain, especially headaches.	Intense blueness of skin, especially of lips; weakness, prostration, sweating, feeble pulse and breathing. Delirium and convulsions may follow	1. Emetic of mustard water. 2. A dose of Epsom salts. 3 A stimulant. 4. Artificial respiration, if necessary. 5. Supportive measures.
Acetophenetidin (phenacetin) Used to relieve pain, especially headaches.	Same as for ACETANILID. Habitual use may cause skin rashes.	Same as for ACETANILID.
Acetylsalicylic Acid (aspirin)	*See* SALICYLATES	*See* SALICYLATES
Acids, Strong Hydrochloric Nitric Oxalic Sulphuric and other strong acids or their concentrated solutions.	Characteristic stains about lips, mouth, and tongue; possibly stains on clothing. Burning pain in mouth, throat, esophagus, and stomach; difficulty in speaking and swallowing; vomiting and diarrhea; rapid, feeble pulse; collapse. The face expresses anxiety and great suffering.	1. Milk of magnesia (1 teacupful) or sodium bicarbonate (2 tablespoonfuls) in a pint of water, or lime in water (if necessary, scrape plaster off walls, powder it, and mix it with water). 2. Egg whites (2 or 3) in water, or olive oil (1 wineglassful), or milk (1 or 2 glasses). 3. Supportive measures. WARNING: Do not force vomiting if extensive corrosion of tissues has taken place. Do not give sodium bicarbonate for oxalic-acid poisoning
Aconite In certain medicines Delphinium seeds	Tingling of lips, tongue, and fingers in few minutes after ingestion, then spreading rapidly	1. Tannic acid (¼ teaspoonful) in water 2. An emetic. 3. A stimulant—aromatic

POISON TABLE—*Continued*

Poison	*Means of Recognition*	*What to Do*
Aconite (cont.) Larkspur seeds Monkshood (all parts of plant)	to face and rest of body. Excessive salivation, nausea, vomiting, and diarrhea; pulse at first slow and feeble, later irregular and very rapid; dizziness and muscular weakness; skin cold and clammy, face pale; pupils first constricted, then dilated; convulsions common.	spirits of ammonia (½ teaspoonful) in water. 4 Artificial respiration if necessary. 5. Supportive measures. Place victim on back with head lower than feet. *Warmth essential*
Alcohol, Methyl (wood alcohol)	Abdominal pain, weakness, dizziness, nausea, vomiting, headache, dimness of vision, rapid, deep, forced, breathing and intense blueness of skin. In fatal cases sighing respiration, cold sweats, delirium, and coma precede death. In recovered cases, blindness is common.	1. Emetic of mustard water followed by sodium bicarbonate (2 teaspoonfuls) in a pint of warm water. Induce vomiting again and give another dose of sodium bicarbonate (⅔ teaspoonful in a glass of water). 2. A large dose of Epsom salts. 3. A stimulant. 4. Supportive measures. *Warmth essential.*
Alkalis, Caustic Ammonia Caustic lime (quicklime) Caustic potash (lye) Caustic soda (washing soda)	Same as for ACIDS. The stains about the lips, mouth, and tongue are dirty white turning deep red, and then black.	1. Vinegar (1 wineglassful) or the juice of 4 lemons in a pint of water. 2. Raw egg whites (2 or 3) in water, or olive oil (1 wineglassful), or milk (1 or 2 glasses). WARNING: Do not force vomiting if the caustic alkali taken was in concentrated form, as indicated by severe corrosion of lips, mouth, and tongue.

POISON TABLE—*Continued*

Poison	*Means of Recognition*	*What to Do*
Allonal	See under BARBITURATES.	See under BARBITURATES.
Aminopyrine (pyramidon) Used to relieve pain, especially headaches.	Depression, rapid pulse, collapse, blueness of skin, sweating, fall in temperature. Convulsions and delirium may occur. Habitual use may produce skin rashes.	1. Emetic of mustard water. 2. Dose of Epsom salts. 3. A stimulant. 4. Supportive measures. 5. Artificial respiration, if necessary.
Ammonia	See under ALKALIS, CAUSTIC.	See under ALKALIS, CAUSTIC.
Amytal	See under BARBITURATES.	See under BARBITURATES.
Antipyrine Used to relieve pain, especially headaches.	Same as for AMINOPYRINE.	Same as for AMINOPYRINE.
Arsenic Fly poison Fowler's solution (a medicine containing arsenic) Paris green Rat poison (Rough on Rats)	Burning pain in throat and stomach. Faintness and depression in about ½ hour. Nausea, vomiting, and diarrhea (vomited matter and stools may be blood-stained). Tenderness of abdomen. Cold, clammy skin, feeble pulse.	1. Emetic consisting of mustard (1 teaspoonful) and salt (1 tablespoonful) to 1 glass of water. Give several glassfuls and induce vomiting repeatedly. 2. Send to drugstore for freshly prepared hydrated oxide of iron and magnesia (the official arsenic antidote). Give 1 wineglassful and induce vomiting again. 3. Castor oil (2 tablespoonfuls) to clean out intestines. 4. Demulcent drinks. 5. A stimulant. 6. Supportive measures.

POISON TABLE—*Continued*

Poison	*Means of Recognition*	*What to Do*
Aspirin	See SALICYLATES.	See SALICYLATES.
Atropine Used in certain medicines Belladonna Berries of deadly nightshade Eye lotions	Dryness of nose, mouth, and throat with great thirst, flushed face, widely dilated pupils, strong, rapid pulse; distorted vision; drunken gait and loud laughing and talking (often mistaken for drunkenness), possibly delirium and convulsions, later great depression and possibly collapse.	1. Emetic of mustard water. 2. Tannic acid (¼ teaspoonful) in 1 glass of water, or strong tea, and induce vomiting again. 3. Apply ice bag to heart to quiet delirium. 4. A stimulant during depressed stage. 5. Artificial respiration, if necessary. 6. Supportive measures.
Barbital	See under BARBITURATES.	See under BARBITURATES.
Barbiturates Allonal Amytal Barbital (veronal) Phenobarbital (luminal) Used as sedatives and to induce sleep and relieve pain.	Mental confusion and drowsiness followed by coma. Rapid pulse, moist skin. Later collapse. The pupils are usually constricted but may be dilated.	1. If victim is conscious, an emetic of mustard water. 2. Quantities of strong, black coffee as stimulant. 3. Try to keep victim awake by walking him about, but not to point of exhaustion. Slap his hands, face, neck, back and chest with a cold, wet towel. 4. If victim is in coma when found, keep warm with blankets and external heat until physician arrives.
Belladonna Berries of deadly nightshade Eye lotions	Same as ATROPINE.	Same as ATROPINE.

POISON TABLE—*Continued*

Poison	*Means of Recognition*	*What to Do*
Benzine	See PETROLEUM DISTILLATES.	See PETROLEUM DISTILLATES.
Bichloride of Mercury	See MERCURY BICHLORIDE.	See MERCURY BICHLORIDE.
Bitter Almond Oil	See under CYANIDES.	See under CYANIDES.
Boric Acid	Cold, clammy skin, weak pulse, abdominal pain, vomiting, diarrhea, and collapse.	1. Emetic of mustard water. 2. Strong, black coffee as stimulant. 3. Alkaline drinks (fruit juices and sodium-bicarbonate solution) in abundance. 4. Supportive measures.
Bromides Used as sedatives.	Acute poisoning rare. Chronic poisoning characterized by skin rashes.	Stop drug. Consult a physician at once.
Camphor Camphorated oil Spirits of camphor	Odor of camphor on breath. Burning pain in stomach. Later muscular twitching, delirium, convulsions, and perhaps still later, coma.	1. Emetic of mustard water. 2. Smelling salts or diluted ammonia held below nose. 3. Hot, black coffee as stimulant. 4. Artificial respiration, if necessary. 5. Supportive measures.
Carbolic Acid (phenol) Creolin Lysol Other disinfectants containing carbolic acid	Odor of carbolic on breath. White stains about lips, mouth, and tongue by pure acid; black stains by impure acid. Burning pain in mouth, throat, and stomach; rapid pulse, cold sweat. Immediate collapse with intense	1. Immediately give soapsuds or Epsom salts (2 tablespoonfuls) in a pint of water and follow with several glassfuls of lukewarm water as an emetic to induce vomiting. 2. Flour and water or starch and water.

POISON TABLE—*Continued*

Poison	*Means of Recognition*	*What to Do*
Carbolic Acid (cont.)	blueness of skin if large dose was taken.	3. Supportive measures IMPORTANT: Do not give oils or alcoholic drinks. Alcohol dissolves pheno and is quickly absorbed, thus carrying the phenol rapidly into the system.
Caustic Alkalis Caustic lime (quicklime) Caustic potash (lye) Caustic soda (washing soda)	See under ALKALIS, CAUSTIC.	See under ALKALIS, CAUSTIC.
Chloral Hydrate Used to induce sleep.	Drowsiness followed by coma; cold hands and feet; convulsions, delirium, and blueness of skin.	1. If victim is conscious, tannic acid (⅓ teaspoonful) in a glass of water, or strong tea, followed by an emetic of mustard water. 2. Strong, black coffee as stimulant. 3. Keep victim awake by walking him about, but not to point of exhaustion. Slap his hands, face, neck, and chest with a cold, wet towel. 4. If victim is in coma when found, keep warm with blankets and external heat until physician arrives. 5. Artificial respiration, if necessary.
Cocaine	Dilated pupils; talkativeness, wild laughter; nausea, vomiting, and	1. Hold cloth wet with diluted ammonia under nose.

POISON TABLE—*Continued*

Poison	*Means of Recognition*	*What to Do*
Cocaine (cont.)	abdominal pain; convulsions and finally coma. As cocaine is destroyed rapidly by the tissues, keeping the victim alive for only a few minutes is of great importance.	2. Tannic acid (¼ teaspoonful) in a glass o water, or strong tea, followed by an emetic of mustard water. 3. Strong, black coffee as stimulant. 4. Artificial respiration. if necessary. 5. Supportive measures.
Codeine	*See* OPIUM.	*See* OPIUM.
Corrosives Acids Alkalis, caustic Carbolic acid (phenol) Mercury bichloride (corrosive sublimate) Silver nitrate	See under name of corrosive.	See under name of corrosive.
Creolin	See CARBOLIC ACID.	See CARBOLIC ACID.
Cyanides Bitter almond oil Hydrocyanic acid Potassium cyanide Prussic acid Sodium cyanide	One of the deadliest of poisons: failure of heart and respiration, and death may occur in a few seconds. If patient survives an hour, recovery is possible. Odor of almonds or peach kernels on breath; breathing in great gasps with intervals between breaths, open, stary eyes with dilated pupils, unconsciousness, violent convulsions, coma.	If available, immediately break amyl-nitrite ampules under victim's nose so that he can inhale fumes or give inhalations of ammonia. Place victim on back with feet raised. Dash cold water on face and chest. Administer artificial respiration if breathing stops. Usually it is impossible to give an emetic. A stomach tube must be used.

POISON TABLE—*Continued*

Poison	*Means of Recognition*	*What to Do*
Delphinium Seeds Contain aconite; may be eaten by children	Same as for ACONITE.	Same as for ACONITE.
Digitalis Foxglove Heart medicines Squill	Nausea, vomiting, colic, and diarrhea; giddiness, faintness, dim sight; pulse slow then rapid and irregular; later, convulsions, collapse, and coma.	1. Tannic acid (1 teaspoonful in a pint of water) or quantities of strong tea and induce vomiting. 2. Aromatic spirits of ammonia as stimulant. 3. Artificial respiration, if necessary. 4. Supportive measures. Quiet and warmth essential. Hot-water bottle over abdomen.
Eye Lotions Containing Belladonna	See ATROPINE.	See ATROPINE.
Fluorides Hydrofluoric acid Sodium fluoride Roach powder	Burning cramplike pains in abdomen; grayish-blue skin, sometimes muscular twitching and convulsions.	1. Quantities of water to drink. 2. Finely divided chalk or limewater. 3. A stimulant. 4. Artificial respiration, if necessary
Fly Poison	See ARSENIC.	See ARSENIC.
Food Poisoning	See pages 182–183.	See pages 182–183.
Formaldehyde Antiseptic, disinfectant, and deodorant solutions.	Characteristic odor on breath; burning sensation in stomach; severe abdominal pain; unconsciousness and collapse	1 Very weak solution of ammonia or aromatic spirits of ammonia (½ teaspoonful) in water. 2. 2 or 3 egg whites in water, or milk, or flour and water. 3. Supportive measures.

POISON TABLE—*Continued*

Poison	*Means of Recognition*	*What to Do*
Formalin	See FORMALDEHYDE.	See FORMALDEHYDE.
Fowler's Solution	See ARSENIC.	See ARSENIC.
Foxglove	See DIGITALIS.	See DIGITALIS.
Gasoline	See PETROLEUM DISTILLATES.	See PETROLEUM DISTILLATES.
Headache Remedies Acetanilid Acetophenetidin (phenacetin) Acetylsalicylic acid (aspirin) Aminopyrine (pyramidon) Antipyrine	See under name of drug.	See under name of drug.
Hydrochloric Acid	See ACIDS.	See ACIDS.
Hydrocyanic Acid	See CYANIDES.	See CYANIDES.
Hydrofluoric Acid	See FLUORIDES.	See FLUORIDES.
Iodine	Acrid taste in mouth; pain and feeling of great warmth in throat and stomach; vomiting, purging, and great thirst. Vomited matter may look blue if starchy food is in stomach.	1. Give starch in water or flour in water freely, followed by an emetic to induce vomiting until vomited matter is no longer blue in color. 2. Demulcent drinks—egg whites in water or flax seed in water. 3. A stimulant. 4. Supportive measures.
Kerosene	See PETROLEUM DISTILLATES.	See PETROLEUM DISTILLATES.
Larkspur Seeds	See ACONITE.	See ACONITE.

POISON TABLE—*Continued*

Poison	*Means of Recognition*	*What to Do*
Laudanum	See OPIUM.	See OPIUM.
Lead Compounds Lead acetate (sugar of lead) Lead carbonate (white lead) Lead oxide (litharge)	At first metallic taste; dry, constricted throat; vomiting and diarrhea; cramps in legs and local palsies common. Later, a blue line on gums, anemia, and paralysis may appear.	1. Epsom salts (2 tablespoonfuls) in a pint of water, followed by an emetic of mustard water or plain warm water. 2. Demulcent drinks—milk or flour and water. 3. A stimulant. 4. Supportive measures.
Lime, Caustic	See ALKALIS, CAUSTIC.	See ALKALIS, CAUSTIC.
Litharge	See LEAD COMPOUNDS.	See LEAD COMPOUNDS.
Lobelia	See NICOTINE.	See NICOTINE.
Luminal	See BARBITURATES.	See BARBITURATES.
Lye	See ALKALIS, CAUSTIC.	See ALKALIS, CAUSTIC.
Lysol	See CARBOLIC ACID.	See CARBOLIC ACID.
Match Heads	See PHOSPHORUS.	See PHOSPHORUS.
Mercury Bichloride (corrosive sublimate) Tablets (usually colored blue) used to make antiseptic solutions.	Metallic taste in mouth, thirst, and soreness in throat and abdomen. Nausea, vomiting, and diarrhea with blood-stained stools. The tongue may look white and shriveled.	1. Raw egg whites (3 to 5) *immediately*, followed by emetic of warm mustard water. *Induce vomiting repeatedly.* 2. Demulcent drinks—milk and ice water. 3. A stimulant. 4. Supportive measures.
Methyl Alcohol (wood alcohol)	See ALCOHOL, METHYL.	See ALCOHOL, METHYL.
Monkshood	See ACONITE.	See ACONITE.

POISON TABLE—*Continued*

Poison	*Means of Recognition*	*What to Do*
Morphine	See OPIUM.	See OPIUM.
Mushrooms Poisonous fungi (toadstools)	Symptoms appear from 2–3 hours to 8–12 hours, according to variety eaten. Violent abdominal colic and cramps; vomiting and diarrhea; slow pulse and snoring breathing. Later, jaundice and often collapse, coma, and convulsions.	1. Emetic of mustard water. 2. Large dose of Epsom salts. 3. A stimulant. 4. Supportive measures.
Naphtha	See PETROLEUM DISTILLATES.	See PETROLEUM DISTILLATES.
Nicotine Lobelia Tobacco	Severe nausea and vomiting; weak, rapid pulse and labored breathing. Later, muscular twitching followed by convulsions and coma.	1. Emetic of mustard water. 2. Tannic acid (½ teaspoonful) in a glass of water and induce vomiting again. 3. A stimulant. 4. Supportive measures.
Nightshade (deadly) Berries	See ATROPINE.	See ATROPINE.
Nitric Acid	See ACIDS.	See ACIDS.
Nux Vomica	See STRYCHNINE.	See STRYCHNINE.
Opium and Its Preparations Codeine Heroin Laudanum Morphine Paregoric Soothing sirups	Stage 1. Period of exhilaration followed by headache, drowsiness, rapid pulse and breathing, face flushed. Stage 2. Sleepiness, but patient can be roused; pulse slow, breathing quiet, face pale, sweat on forehead.	1. If victim is conscious, emetic of mustard water. 2. If potassium-permanganate crystals are available or can be obtained quickly from the drugstore, take up a small amount (about 4 grains) on a penknife

POISON TABLE—*Continued*

Poison	*Means of Recognition*	*What to Do*
Opium and Its Preparations (cont.)	Stage 3. Collapse, coma, pulse feeble, breathing stertorous, muscles relaxed, body cold.	point, mix it with a pint of water, strain, and have the victim swallow it. Then induce vomiting again by giving mustard water. 3. Strong, black coffee as stimulant. 4. Keep victim awake if possible by walking him about, but not to point of exhaustion. Slap his face, neck, back, and chest with a cold, wet towel 5. If victim is unconscious, keep him warm with blankets and external heat until doctor arrives 6. Give artificial respiration, if necessary.
Oxalic Acid	See ACIDS.	See ACIDS.
Pain-Relieving Drugs Acetanilid Acetophenetidin (phenacetin) Aminopyrine (pyramidon) Antipyrine	See under name of drug.	See under name of drug.
Barbiturates Allonal Amytal Barbital (veronal) Phenobarbital (luminal)	See under BARBITURATES.	See under BARBITURATES.

POISON TABLE—*Continued*

Poison	*Means of Recognition*	*What to Do*
Pain-Relieving Drugs (cont.) Opium and its preparations Codeine Heroin Laudanum Morphine Paregoric Soothing sirups	See under OPIUM.	See under OPIUM.
Paregoric	See OPIUM.	See OPIUM.
Paris Green	See ARSENIC.	See ARSENIC.
Petroleum Distillates Benzine Gasoline Kerosene Naphtha	Vomiting, stomach pain, labored breathing, blueness of skin, possibly collapse. The effect of benzine, naphtha, and gasoline on the nervous system is to produce symptoms resembling drunkenness.	1. Emetic of mustard water. 2. Dose of Epsom salts. 3. Black coffee as stimulant. *No alcohol.* 4. Artificial respiration, if necessary.
Phenacetin	Same as for ACETANILID.	Same as for ACETANILID.
Phenol	See CARBOLIC ACID.	See CARBOLIC ACID.
Phosphorus Match heads Rat poison	Garlic taste in mouth and odor of garlic on breath; nose-bleed, vomiting. Vomit is luminous in dark. Most serious symptoms, including severe jaundice, may not appear for 3 days or more.	1. Emetic of warm mustard water. 2. If copper sulphate (which acts as an emetic) is available or can be obtained quickly from a drugstore, give 3 grains (a scant penknife-pointful) in a glass of water every 15 minutes until vomiting occurs. The copper sulphate forms a coating

POISON TABLE—*Continued*

Poison	*Means of Recognition*	*What to Do*
Phosphorus (cont.)		over the phosphorus so that it cannot be absorbed. Follow with lukewarm water and induce vomiting again to get the coated phosphorus out of stomach. 3. Demulcent drinks of egg whites in water or flour and water. Do not give oils, fats, or milk (which contains fat). 4. Supportive measures.
Potash, Caustic	See ALKALIS, CAUSTIC.	See ALKALIS, CAUSTIC.
Potassium Cyanide *Prussic Acid*	See CYANIDES.	See CYANIDES.
Pyramidon	See AMINOPYRINE.	See AMINOPYRINE.
Quicklime	See ALKALIS, CAUSTIC.	See ALKALIS, CAUSTIC.
Quinine	Mild symptoms, if a person is sensitive to quinine, include ringing in ears, slight impairment of hearing, and possibly skin eruptions, dizziness, and temporary blindness. If poisonous dose is taken, additional symptoms include pain in stomach, nausea and vomiting, and perhaps delirium and coma.	Mild symptoms require no treatment. Strong, black coffee gives relief. *Acute poisoning* 1. Emetic. 2. Potassium - permanganate solution (a penknife-pointful—4 grains—in a pint of water). Then induce vomiting again. 3. Strong, black coffee as stimulant. 4. Supportive measures.
Rat Poison Containing Arsenic Rough on Rats	See ARSENIC.	See ARSENIC.

POISON TABLE—*Continued*

Poison	*Means of Recognition*	*What to Do*
Rat Poison Containing Phosphorus	See PHOSPHORUS.	See PHOSPHORUS.
Rat Poison Containing Strychnine	See STRYCHNINE.	See STRYCHNINE.
Roach Powders	See FLUORIDES.	See FLUORIDES.
Rough on Rats	See ARSENIC.	See ARSENIC.
Salicylates Acetylsalicylic acid (aspirin) Sodium salicylate	Serious poisoning rare. Sensitivity to drug may cause stomach upsets, nausea, skin eruptions. Overdosage may cause headache, apathy, frequency of urination, impairment of hearing and vision. In some cases mental excitement—"salicylic jag."	1. Stop drug. 2. Sodium bicarbonate to hasten elimination. 3. Ice bag or mustard plaster on stomach to relieve vomiting. Consult doctor at once if overdosage symptoms develop
Sleep-Inducing Medicines Barbiturates Allonal Amytal Barbital (veronal) Phenobarbital (luminal)	See BARBITURATES.	See BARBITURATES.
Chloral hydrate	See CHLORAL HYDRATE.	See CHLORAL HYDRATE.
Opium and its preparations Codeine Heroin Laudanum Morphine Paregoric Soothing sirups	See OPIUM.	See OPIUM.

POISON TABLE—*Continued*

Poison	*Means of Recognition*	*What to Do*
Silver Compounds Silver nitrate	Pain in throat and stomach, vomiting of black-colored material, and coma. Lips may first have a gray-white color, then black.	1. Large quantities of salt water followed by emetic of mustard water 2. Demulcent drinks. 3. A stimulant, if necessary 4. Supportive measures.
Soda, Caustic	See ALKALIS, CAUSTIC	See ALKALIS CAUSTIC.
Sodium Cyanide	See CYANIDES.	See CYANIDES
Squill	See DIGITALIS.	See DIGITALIS.
Strychnine In certain medicines and rat poisons. Nux vomica	Terror-stricken face, "pop" eyes with dilated pupils, fixed grin; feeling of suffocation, feeble pulse; tetanic muscular spasms during which body arches and rests on head and heels and then relaxes. Antidotes to be useful must be given immediately, as strychnine is rapidly absorbed.	1. Give immediately a mixture consisting of potassium permanganate (a penknife-pointful—4 grains), tannic acid (½ teaspoonful), and powdered charcoal (1 tablespoonful) in a pint of water. If only one of the ingredients listed is available, give it. Potassium permanganate oxidizes and thus destroys the drug, tannic acid precipitates it, and charcoal adsorbs it. CAUTION: Do not give a stimulant, as it will intensify the effect of the strychnine and may bring on convulsions. 2. Supportive measures. The victim must be kept *very quiet* in a dark room remote from all noises. 3. Artificial respiration, if necessary.

POISON TABLE—*Continued*

Poison	*Means of Recognition*	*What to Do*
Sugar of Lead	See LEAD COMPOUNDS	See LEAD COMPOUNDS.
Sulphuric Acid	See ACIDS	See ACIDS.
Toadstools	See MUSHROOMS.	See MUSHROOMS.
Tobacco	See NICOTINE.	See NICOTINE.
Turpentine Oil	Characteristic odor on breath; burning sensation in throat and stomach; nausea, vomiting, colic, and diarrhea; skin rash; rapid, stertorous breathing, pulse slow and feeble; convulsions, unconsciousness, and coma.	1. Emetic of mustard water. 2. Dose of Epsom salts. 3. Demulcent drinks. 4. A stimulant. 5. Supportive measures.
Veronal	See BARBITURATES.	See BARBITURATES.
White Lead	See LEAD COMPOUNDS.	See LEAD COMPOUNDS.
Wood Alcohol	See ALCOHOL, METHYL.	See ALCOHOL, METHYL.

POTASH, CAUSTIC, POISONING. *See* Poison Table, Alkalis, Caustic, page 251.

POTASSIUM-CYANIDE POISONING. *See* Poison Table, Cyanides, page 256.

POWDER BURNS. *See* Burns, Powder.

PRESSURE POINTS FOR CONTROL OF BLEEDING. *See* Bleeding, How to Stop It.

See also External Bleeding, Part II, pages 73-84.

PRUSSIC-ACID POISONING. *See* Poison Table, Cyanides, page 256.

PUNCTURED WOUNDS. *See under* Wounds, page 319.

PYRAMIDON POISONING. *See* Poison Table, Aminopyrine, page 252.

Q

QUICKLIME POISONING. *See* Poison Table, Alkalis, Caustic, page 251.
QUININE POISONING. *See* Poison Table, page 263.

R

RABIES. *See under* Bites, Animal, page 123.
RAT POISON (ARSENIC POISONING). *See* Poison Table, Arsenic, page 252.
RAT POISON (PHOSPHORUS POISONING). *See* Poison Table, Phosphorus, page 262.
RAT POISON (STRYCHNINE POISONING). *See* Poison Table, Strychnine, page 265.
RATTLESNAKE BITES. *See* Bites, Snake.
RESCUE. *See under* Drowning, Electric Shock, Fire, Gas Poisoning, Ice Accidents.
RESPIRATION, ARTIFICIAL. *See* Artificial Respiration, Part II, pages 67-70.
RESUSCITATION. *See* Artificial Respiration, Part II, pages 67-70.
RIBS, FRACTURE OF. *See under* Fractures, page 212.
RIGOR MORTIS. *See* Death, Signs of.
ROACH-POWDER POISONING. *See* Poison Table, Fluorides, page 257.
"ROUGH ON RATS" POISONING. *See* Poison Table, Arsenic, page 252.

S

SALICYLATES (ASPIRIN AND SODIUM SALICYLATE), POISONING. *See* Poison Table, page 264.
SCALDS. *See* Burns, Hot-Liquid.
SHOCK. *See* Part II, pages 92-98.
NOTE: In some localities apoplexy or a paralytic stroke is called "a shock." For this condition *see* Apoplexy.
SHOCK, ELECTRIC. *See* Electric Shock.

SHOULDER, BANDAGE FOR. *See* Bandaging, page 109.
BLEEDING FROM. *See* Bleeding, How to Stop It, page 133.
DISLOCATION OF. *See* Dislocations.
SHOT WOUNDS. *See* Punctured Wounds, page 319.
See also Tetanus.
SHRAPNEL WOUNDS. *See* Punctured Wounds, page 319.
SILVER-NITRATE POISONING. *See* Poison Table, Silver Compounds, page 265.
SKULL FRACTURE. *See under* Fractures, page 208.
SMOKE INHALATION. *See under* Gas Asphyxiation, page 220.
SMOTHERING. *See under* Asphyxia, Part II, page 65.
SNAKE BITES. *See* Bites, Snake.
SODA, CAUSTIC, POISONING. *See* Poison Table, Alkalis, Caustic, page 251.
SODIUM-CYANIDE POISONING. *See* Poison Table, Cyanides, page 256.
SOOTHING SIRUP, POISONING FROM. *See* Poison Table, Opium, page 260.
SPIDER BITES. *See* Bites, Spider *under* Bites, Insect, page 126.
SPINAL-CORD INJURIES. *See under* Fractures, Spinal Fracture, page 214.
SPINE, FRACTUGE OF. *See under* Fractures, page 214.

SPLINTERS

A splinter of wood, metal, glass, or any other material driven through the skin into the flesh is technically a puncture wound in which a foreign body remains.

What to Do. To remove a splinter which is not imbedded deeply, first paint the skin over the splinter with 2% iodine and then pick it out with a sterilized needle or sterilized splinter forceps or tweezers. Pass the tip (or tips) of the instrument used through a flame to sterilize it and do not touch the tip with anything after it has been sterilized. Use sterile gauze or cotton to wipe off the carbon left on the point of a needle by passing it through a match flame. In removing the splinter, pull it out along the same angle at

which it entered the flesh. After removal squeeze or "milk" the flesh surrounding the wound to encourage bleeding. Then apply 2% iodine well down into the wound. After the iodine is dry, cover the wound with a sterile compress.

A splinter driven under the nail is most easily removed by pulling it out with sterilized tweezers or splinter forceps. If the end of the splinter is broken off so that it cannot be reached, scrape the nail over the splinter until it is very thin and then cut out a small V-shaped wedge. Then pick out the splinter as described above.

There is danger of tetanus (see Tetanus) if a splinter is deeply buried in the flesh or if the wound is lacerated and of considerable size. For splinter wounds of this type, always consult a physician.

SPLINTS. *See under* Fractures, page 188.

SPRAINS

A sprain is an injury to a joint. The ankle and wrist joints are the ones most often sprained. A sprain is caused by a sudden wrench which violently stretches, twists, or actually tears the ligaments supporting the joint and the capsule which envelops it. Twisting the foot, turning the ankle, and any unnatural movement of a joint in muscular exercise or in a fall are common causes of sprains. A sprain is sometimes spoken of as a "missed" or temporary dislocation, since it is frequently the result of the damage done when the bones at the joint have sprung out of place and back again.

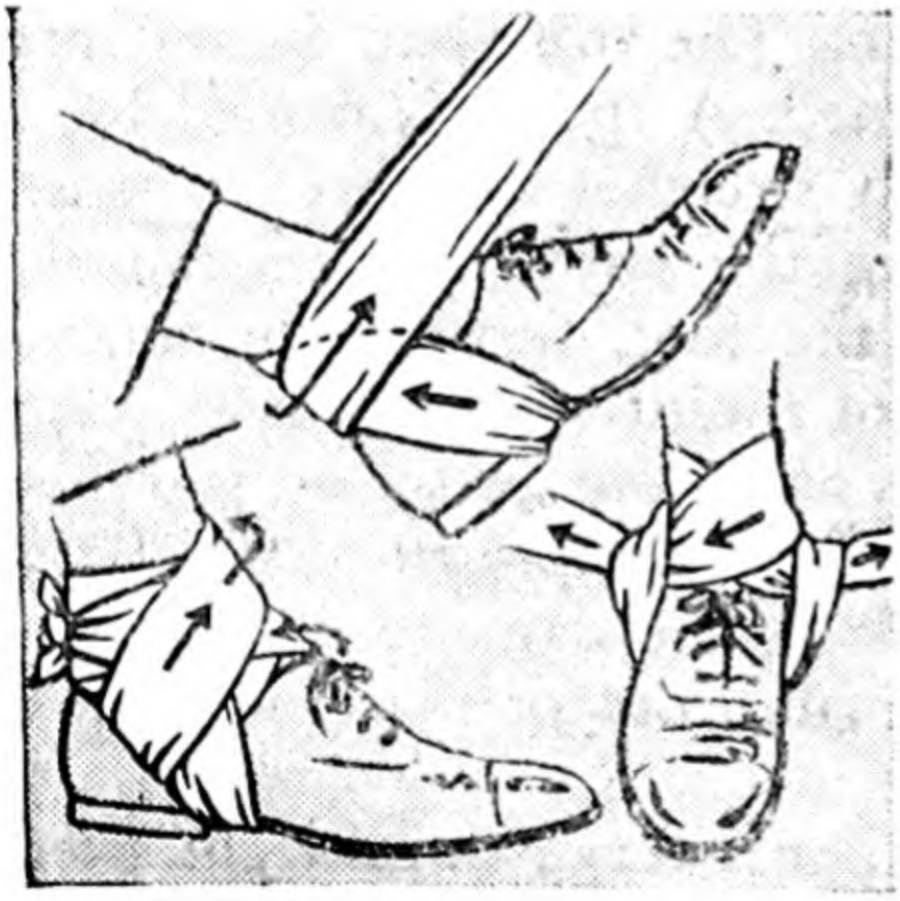
Signs and Symptoms. The joint is very painful right after the injury. Attempts to move it increase the pain. Swelling develops rapidly; discoloration, somewhat later. However, the black-and-blue appearance may last for some time. A sprain may be only a slight injury from which recovery is rapid or it may be very severe and require a long period of rest for the proper healing of torn ligaments. Primary shock

may accompany even a minor sprain but usually it passes off quickly.

What to Do. Elevate the injured joint in a comfortable position. For a sprained wrist, use a large triangular sling; for a sprained ankle or knee, place pillows or folded coats or blankets under the victim's leg. Then apply ice bags or compresses wrung out in cold water. If cold applications fail to relieve the pain, try hot compresses or soaking in a hot Epsom-salt solution.

If the sprain is severe, do not let the victim move the joint until he has been examined by the physician. It may be necessary to have an X-ray picture taken to exclude the possibility of fracture.

When it is necessary for a person with a sprained ankle to walk some distance in order to obtain aid, apply a sprained-ankle bandage. This may be put on by the victim himself if he is alone.



c *a* *b*

Figure 79

1. Do not remove the shoe or boot, but if the shoe is high-topped, unlace it.
2. Place the center of a narrow cravat bandage under the foot just in front of the heel of the shoe to form a stirrup. Carry the ends up around the back of the ankle and cross them just above the heel (Figure 79*a*).
3. Bring the ends to the front of the foot and cross them again just above the instep. Carry the ends downward

and shove one under the outer stirrup and the other end under the inside stirrup just in front of the heel (Figure 79*b*).

4. Pull the ends as tight as possible, cross them over the instep, and tie at the back of the ankle (Figure 79*c*).

SQUILL POISONING. *See* Poison Table, Digitalis, page 257.
STAB WOUNDS. *See* Punctured Wounds, page 319.
STINGS. *See* Insect Bites.
STOMACH, BLEEDING FROM. *See under* Internal Bleeding, Part II, page 85.

STOMACH, FOREIGN BODIES IN

If someone swallows a sharp object such as a piece of broken glass, a tack, a common pin, or an open safety pin, consult a physician at once. *Do not give a laxative.*

STRAINS

A strain is an injury to a muscle or tendon caused by overstretching. The muscles of the back are often strained as a result of heavy lifting in an improper position. In severe strains the muscle fibers or tendons may be torn.

Signs and Symptoms. There is sharp pain or cramp at the time of the injury. Stiffness and soreness develop within the next few hours and movement is painful.

What to Do. Rest and the application of heat give relief. Gentle rubbing with warm alcohol or warm witch hazel helps to allay pain and is useful in stimulating the circulation. More forceful rubbing later on when the pain has subsided helps to loosen up the stiffened muscles. For severe strains, especially of the back muscles, see a physician.

STRANGLING. *See under* Choking, page 151.
STRETCHERS. *See under* Transportation of the Injured, pages 276-280.
STROKE, APOPLECTIC. *See* Apoplexy.
HEAT. *See* Heatstroke and Sunstroke.

SUN. *See* Heatstroke and Sunstroke.

STRYCHNINE POISONING. *See* Poison Table, page 265.

STIES

A sty is an infection of one or more of the tiny oil glands connected with the hair follicles from which the eyelashes grow. Eyestrain may be the indirect cause of sties, because a person suffering from eyestrain usually rubs his eyes frequently, thus irritating the lids and contaminating the hair follicles. Also general ill-health may lower the resistance of the oil glands to infection. Usually this is the underlying cause when a person has one sty after another.

What to Do. Consult a physican if sties occur in "crops." For the local treatment of a sty, apply compresses wrung out in cold water. This will help to lessen the pain and bring the sty "to a head." Hot compresses will aid in the opening of the sty and the evacuation of the pus. Do not squeeze or handle a sty. If pain and swelling are severe, consult a physician.

SUFFOCATION. *See* Asphyxia, Part II, pages 65-71.

SUGAR-OF-LEAD POISONING. *See* Poison Table, Lead Compounds, page 259.

SULPHUR TRIOXIDE (a screening smoke used in warfare). *See under* War Injuries, page 343.

SULPHURIC-ACID POISONING. *See* Poison Table, page 250.

SUNBURN

Sunburn is caused by the action of the sun's rays on the skin. In effect it is like any other first- or second-degree burn. Tanning of the skin by frequent short exposures to the sun's rays is a protection against sunburn. The tan acts as a screen to keep the sun's rays from penetrating to the delicate tissues just under the outer layer of skin. Sunburn usually is acquired when the bare skin is exposed to the summer sun for too long a time before this protective coat-

ing of tan has formed. The application of olive oil, cocoa butter, or "sun-tan" lotion before exposure helps to prevent burning. If a large area of the skin is burned, sunburn may prove to be serious.

What to Do. Any good burn ointment, tannic-acid solution, or tannic-acid jelly will help to relieve discomfort. Calamine lotion to which enough carbolic acid has been added at the drugstore to make a 2% solution, or sterile gauze wet with a solution of Epsom salts or bicarbonate of soda, gives relief if blistering is extensive. For a severe case of sunburn with fever, call a physician.

SUNSTROKE. *See* Heatstroke.

SWALLOWING OF POISONS. *See* Poisons Swallowed, pages 247-249.

For SPECIFIC POISONS SWALLOWED, *see* Poison Table, pages 250-266.

SWALLOWING OF FOREIGN BODIES. See Stomach, Foreign Bodies in.

T

TETANUS

Tetanus, or lockjaw, is a dangerous disease caused by bacilli which grow only in the absence of oxygen. The bacilli thrive in the large intestine of horses, cows, and other animals, where they do no harm. Hence they are present in animal manure and in soil where animal manure has been thrown. Since tetanus bacilli go into the spore or "seed" state when conditions are unsuitable for growth, they can stay alive in the soil sometimes for months until they are transplanted to an environment where they can become active once more.

The tetanus bacilli stay more or less where they are, once they have settled in a wound, and do their damage by manufacturing a toxin which affects the nervous system. Horses can be made immune to this toxin by injecting it in very

small amounts. Blood serum from horses immunized against tetanus toxin is called tetanus antitoxin. It is used by physicians to keep tetanus from developing in patients who have received a wound which carries the danger of tetanus. The victim of a punctured or lacerated wound should consult a physician without delay. Tetanus antitoxin is also used for treatment after the disease has developed.

Tetanus toxin so modified as to make it safe for human inoculation is called tetanus toxoid. Injection of small amounts of tetanus toxoid stimulates the body to work up a permanent defense against the toxin. Thus farmers, dairymen, gardeners, and others whose occupations expose them especially to contaminated soils, and soldiers and industrial workers, who are exposed to the danger of contracting punctured, lacerated, contused, gunpowder, or bullet wounds, may be immunized against tetanus by the injection of tetanus toxoid. It is also considered advisable to protect children against tetanus with tetanus toxoid, as this disease may develop from even slight cuts, scratches, and abrasions. If a person has been immunized, the physician may wish to give another injection of tetanus toxoid to boost immunity in case of a wound in which tetanus is likely to develop.

THERMIT BOMBS, HOW TO EXTINGUISH. *See* Appendix, page 353.
THIGH, BANDAGE FOR. *See* Bandaging, page 108.
BLEEDING FROM. *See* Bleeding, How to Stop It, page 134.
FRACTURE OF. *See under* Fractures, page 202.
THROAT, FOREIGN BODIES IN. *See* Choking.
THUMB, BANDAGE FOR. *See* Bandaging, page 115.
DISLOCATION OF. *See* Dislocations, page 161.
FRACTURE OF. *See under* Fractures, page 194.
TITANIUM TETRACHLORIDE (a screening smoke used in warfare). *See under* War Injuries, page 343.

TOADSTOOLS EATEN. *See* Poison Table, Mushrooms, page 260.

TOBACCO SWALLOWED. *See* Poison Table, Nicotine, page 260.

TOOTHACHE

A tooth aches when a break through the enamel extends inward far enough to let air and liquids come in contact with the nerves which ramify out from the living pulp in the center of the tooth. Or it may be a sign that the tooth is "dying" or "dead," especially if it contains a large cavity or a large filling.

What to Do. Consult a dentist. If toothache occurs at night or in a place where it is impossible to get help from a dentist immediately, temporary measures may relieve the pain, but will not get at the root of the trouble. If there is a cavity in the aching tooth, clean it out with a bit of sterile cotton wrapped around a toothpick. Then insert a piece of cotton which has been dipped into oil of cloves. If there is no cavity, cold or hot applications to the outside of the jaw may give relief. Aspirin tablets taken according to directions also may help to relieve the pain temporarily.

TOURNIQUET. *See under* External Bleeding, Part II, pages 79-83.

TRANSPORTATION OF THE INJURED

It is frequently necessary ω transport an injured person to a hospital, doctor's office, or some other place where he can receive proper medical treatment. For seriously injured persons, it is best to wait for an ambulance or for equipment and trained attendants from a first-aid station, if it is at all possible to do so. Head or back injuries, fractures or suspected fractures, severe wounds, extensive burns—in short,

any serious injury or illness—may be made worse by improper transportation.

If transportation is necessary, always give essential first-aid care on the spot. Make sure that bleeding is checked, that the injured person is breathing, that fractures are properly splinted and none overlooked, and that everything possible has been done to make the victim warm and comfortable. Then make arrangements for transportation according to the nature of the injury and the care which must be taken to avoid complications that might arise as a result of movement.

Stretcher Transportation

Stretcher transportation in a lying position is desirable for all injured persons who are unable to walk, or when the condition might be aggravated by walking.

The most satisfactory stretcher for transporting an injured person is the standard army stretcher. This consists of two long poles of aluminum or wood with a canvas bed between them. Stretchers of this type usually are available at Red Cross First-Aid Stations.

In the absence of "tailor-made" stretchers, satisfactory substitutes may be improvised. Always test an improvised stretcher before placing the victim on it. This is done by using it to lift an uninjured person of about the same weight as the injured person. A blanket should be draped over the stretcher so that it can be folded over the victim to keep him warm underneath as well as on top.

Always make sure before placing an injured person on a stretcher indoors that it will go through the doors and passages through which the person must be carried. If necessary, the victim may be lashed to the stretcher so that it can be tipped sideways or endwise to get through difficult passages and stairways.

Improvised Stretchers

1. With Poles and Blanket

Materials: A blanket, automobile robe, large piece of canvas, rug, or stout sheet. Two poles about seven feet long.

Procedure: Method 1—Spread the blanket lengthwise on the ground. Lay one pole across the center of the blanket and fold the blanket over it so that the free edges meet and the pole is in the fold. Lay the second pole across the center of the folded blanket and fold the free edges toward the fold containing the first pole (Figure 80).

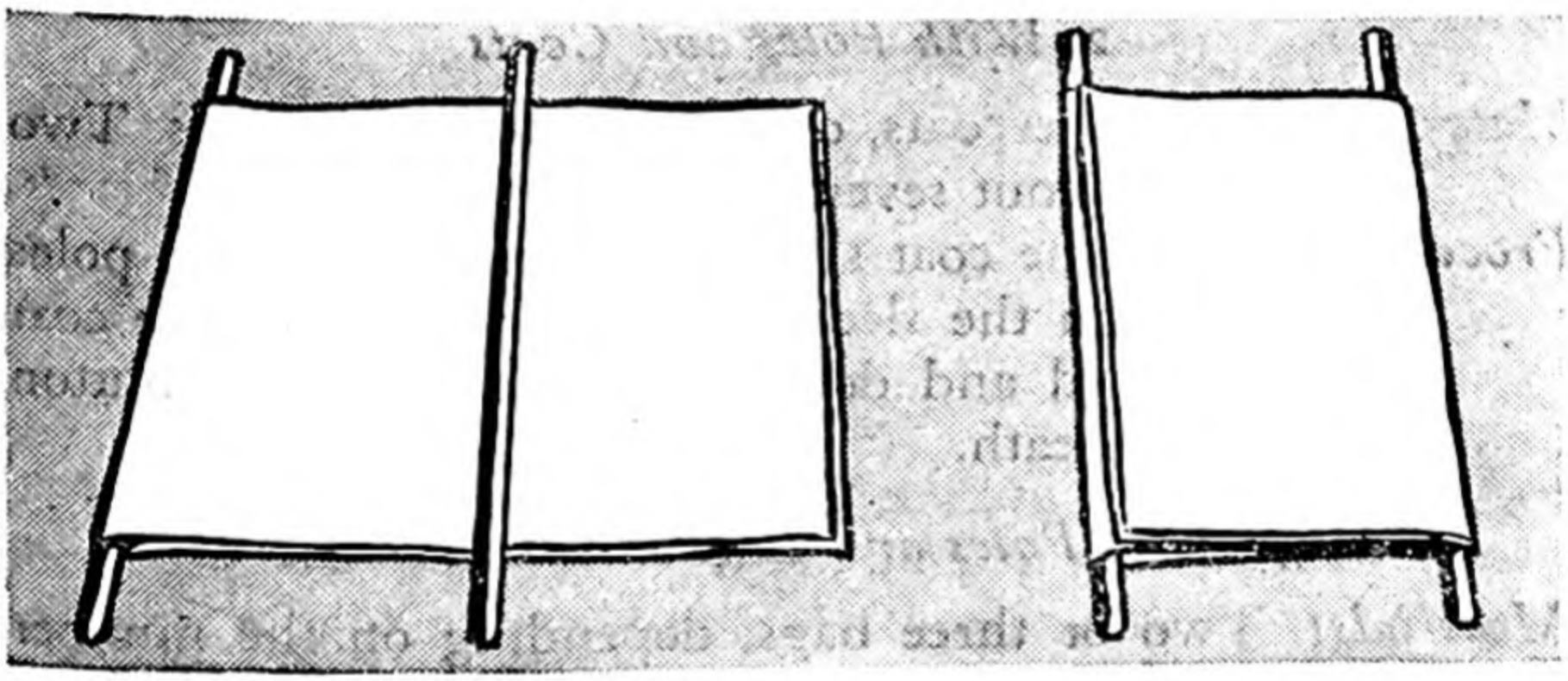


Figure 80

Method 2—To be used when the blanket or other stretcher-bed material is narrow. Lay the poles on the long edges of the blanket. Roll the blanket tightly over them toward the middle until the desired width is reached. Fasten the blanket securely to the poles (Figure 81, page 278).

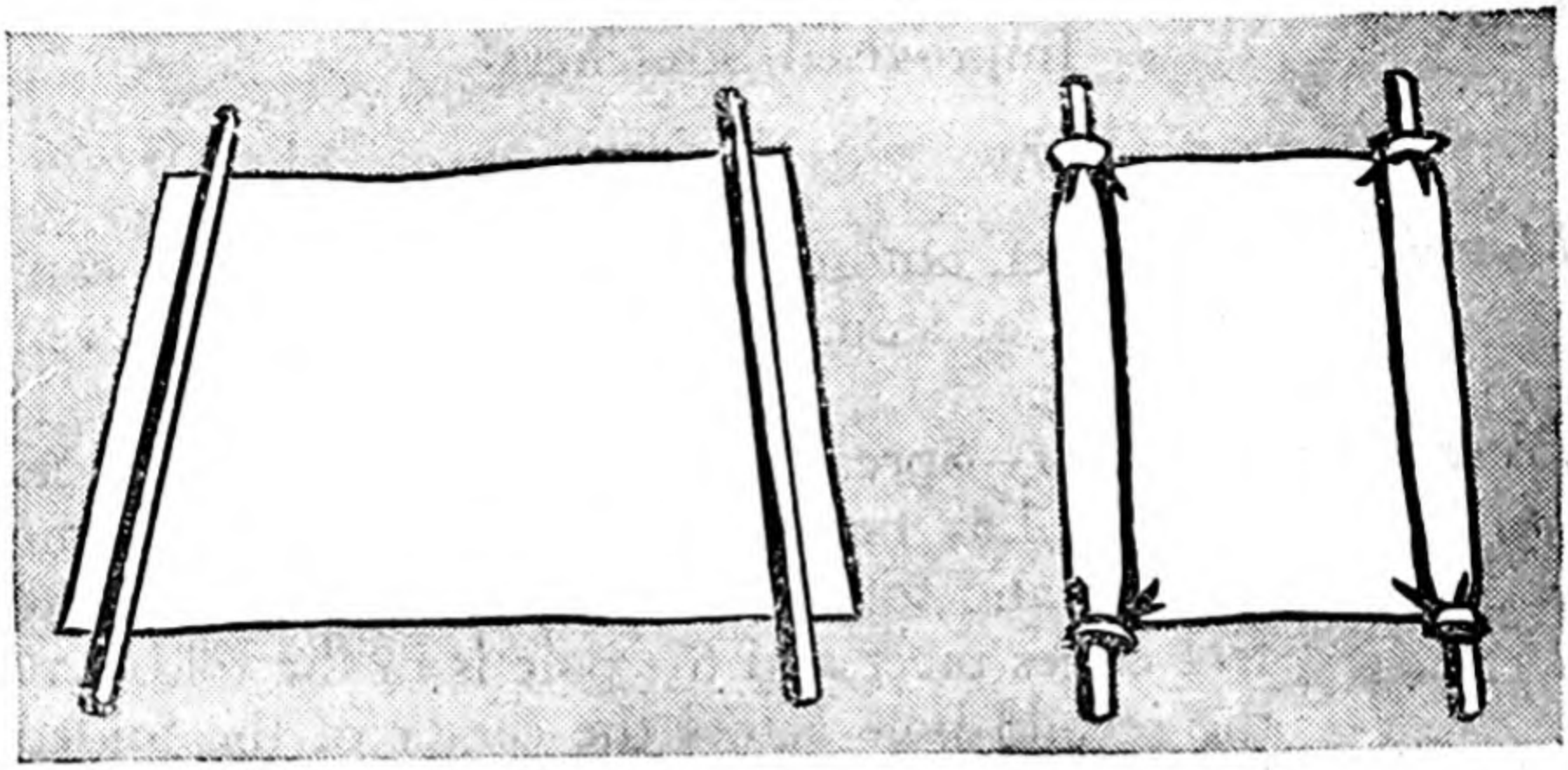


Figure 81

2. *With Poles and Coats*

Materials: Two overcoats, or three or four suit coats. Two poles about seven feet long.

Procedure: Turn the coat sleeves inside out. Pass the poles through the sleeves. Turn the flaps of the coat outward and down over the poles and button underneath.

3. *With Poles and Bags or Cloth Sacks*

Materials: Two or three bags, depending on the number needed to give the length of stretcher bed required. Two poles about seven feet long.

Procedure: Rip or cut openings in the bottom corners of each bag. Pass the poles inside the bags and through the openings.

Blanket Stretcher

When no poles are available, a satisfactory stretcher can be made by placing the patient in the center of a blanket, rug, or other material and rolling the edges toward him to form tight cylinders. The rolled edges furnish a grip for the

bearers. Two and preferably three bearers for each side are required (Figure 82).

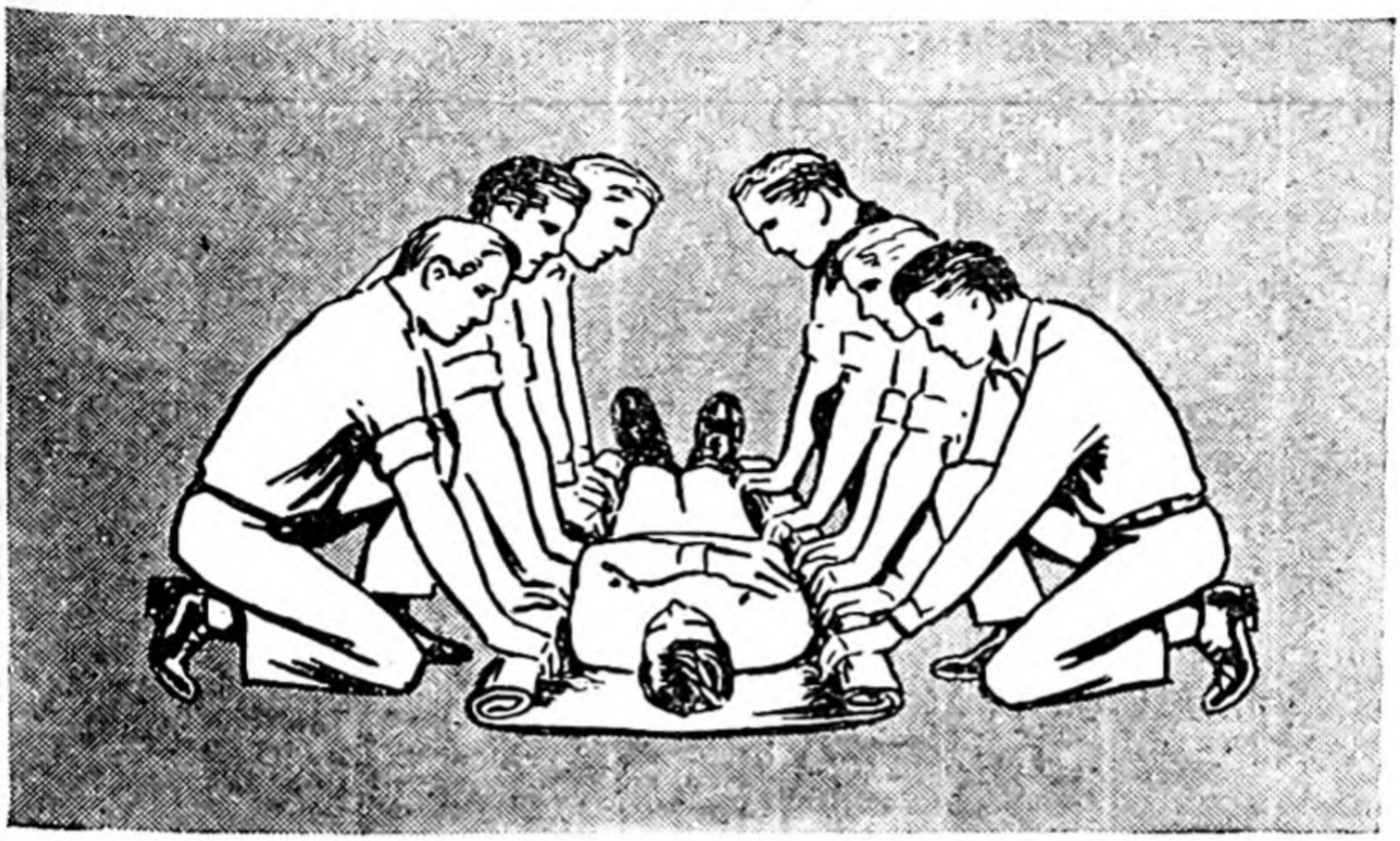


Figure 82

Stretcher-Shaped Objects as Stretchers

Any flat object six or seven feet long and four or five feet wide which is strong enough to support a person may be used as a stretcher. Examples are a wide board or two boards nailed together, a shutter, door, ladder, or bench. The top of an improvised stretcher of this kind should be padded with a blanket, coat, newspapers, or similar material.

Chair Used as Stretcher

A strong, straight-backed chair without arms may be used as a stretcher for an ill person who must be carried up or down narrow, winding stairs or in a small elevator where a stretcher cannot be used. Two bearers are required to lift the chair, one gripping the front legs just below the seat, the other gripping the chair back at the top. The chair with

the ill person in it is tilted backward (Figure 83). In going up- or downstairs, the bearer holding the legs should brace one shoulder against the wall to keep his balance.

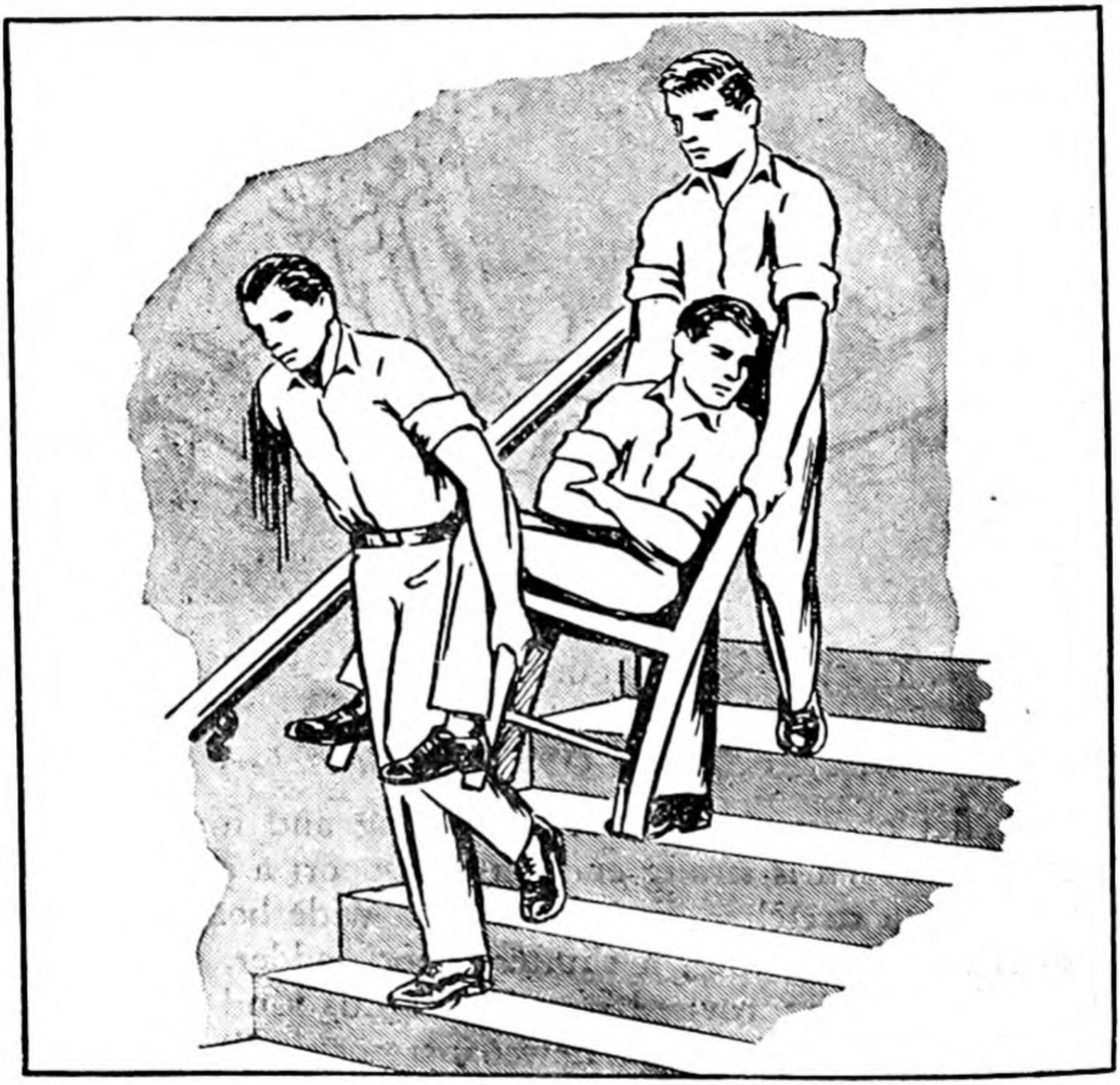


Figure 83

Loading and Unloading Stretchers

Great care must be taken in placing an injured person on a stretcher. The various lifts and carries described below should be demonstrated by an instructor and then practiced under his direction until they can be executed perfectly.

Blanket Carry

A blanket furnishes the best means of placing a severely injured person on a stretcher if it is available and there are enough people present to act as bearers. Lay the blanket tucked or folded lengthwise to two thirds its normal width alongside the victim and tuck the fold snugly against his body (Figure 84). Then, grasping his shoulder and hips,

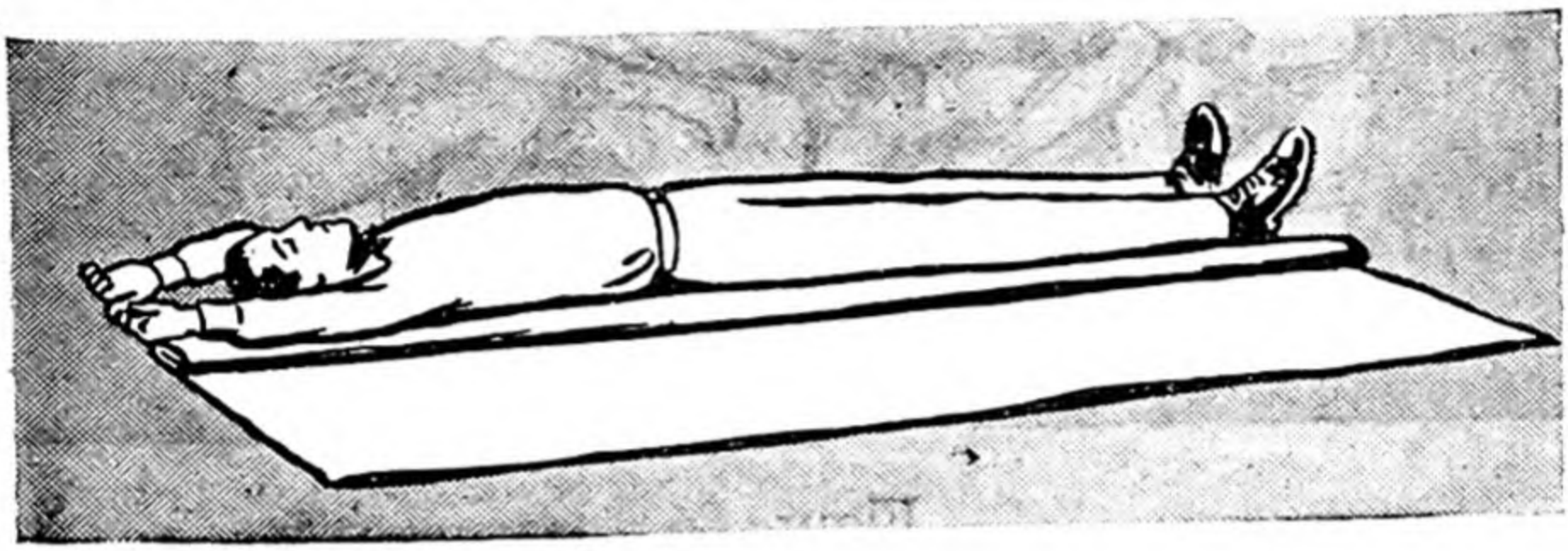


Figure 84

turn him slightly away from the blanket and push the blanket as far under him as possible (Figure 85). Then roll him

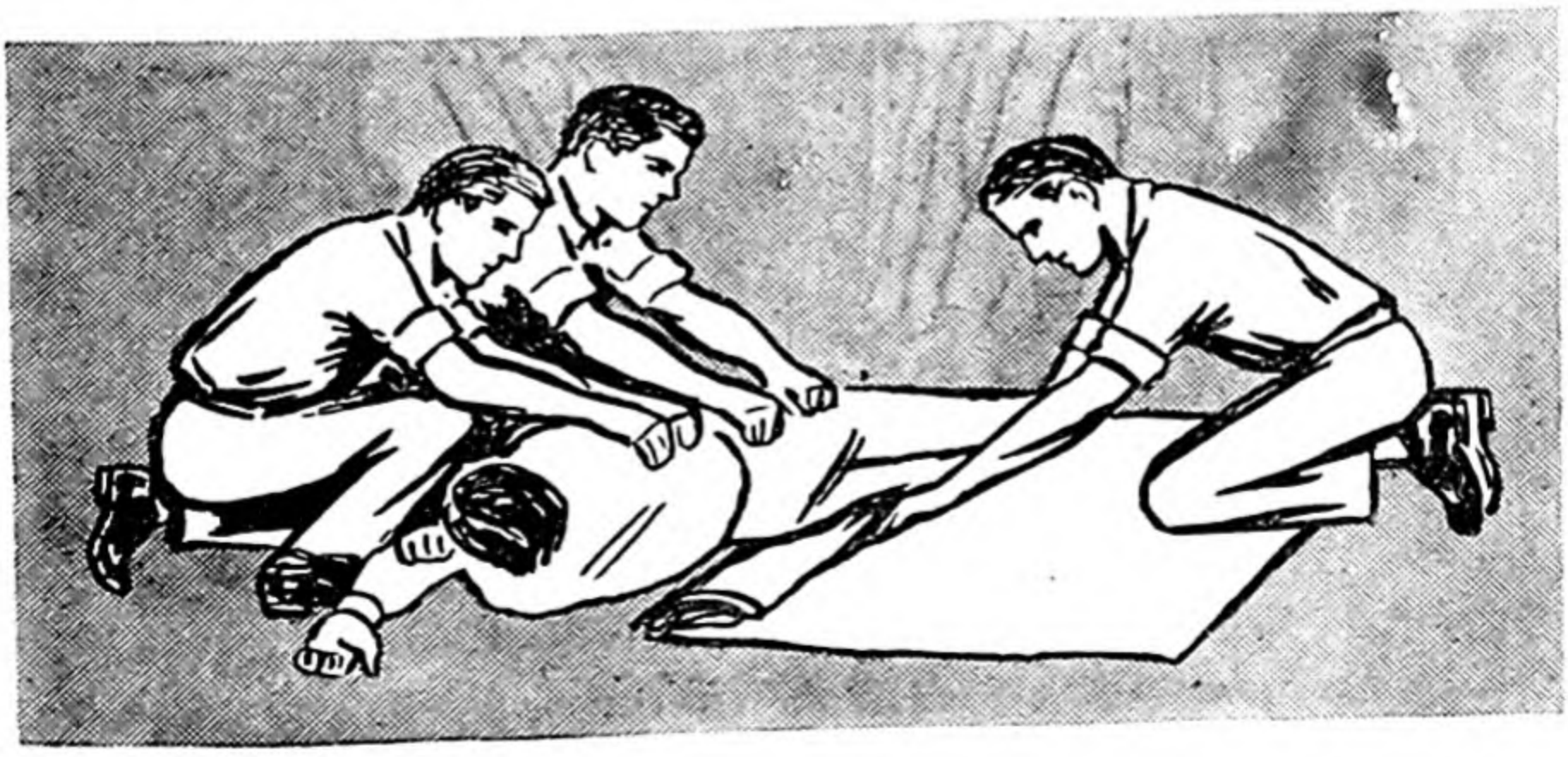


Figure 85

over onto the blanket, turn him slightly in the other direction, and pull the blanket through to his other side (Figure 86). By using this method the injured person is placed in

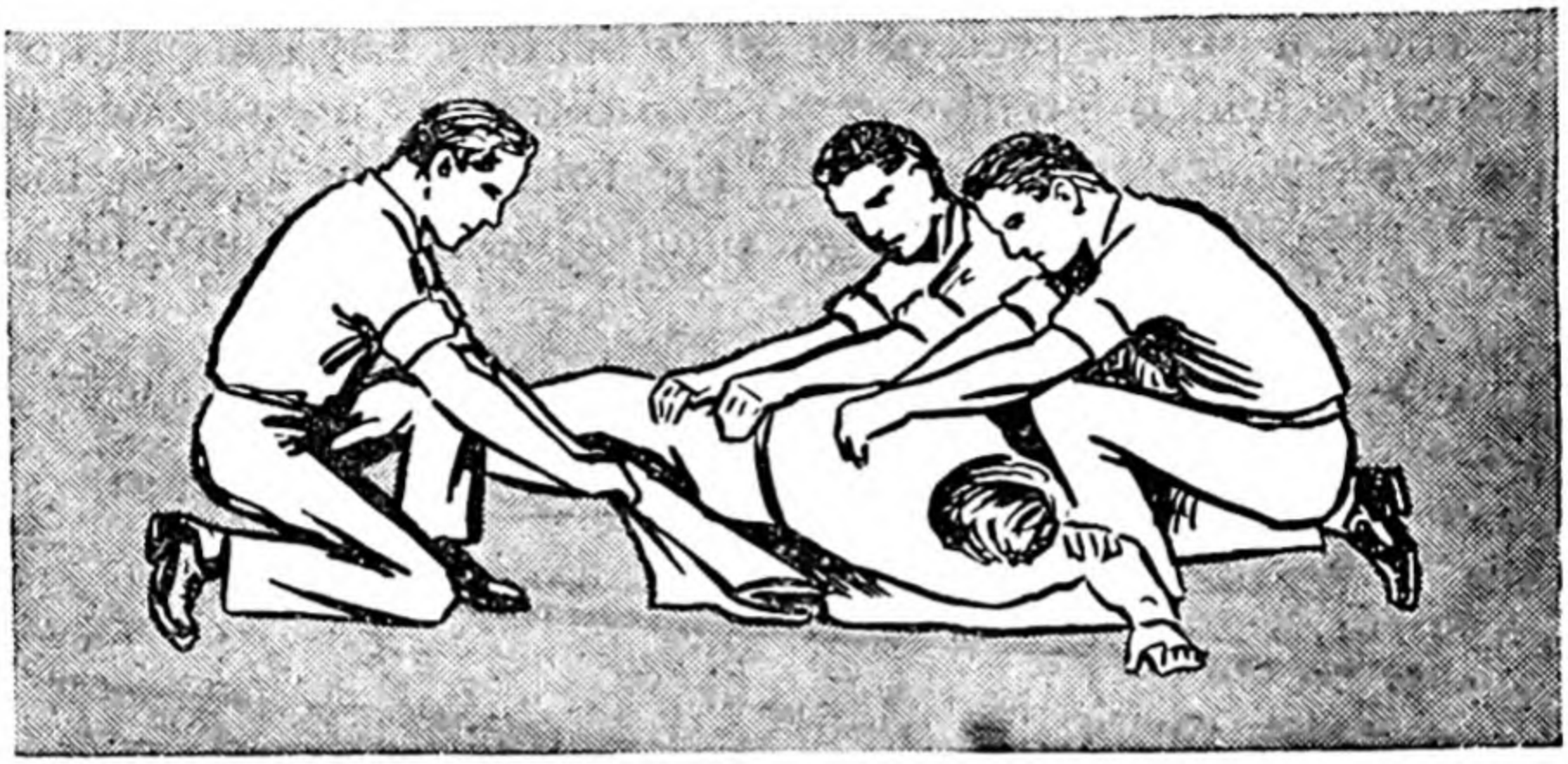


Figure 86

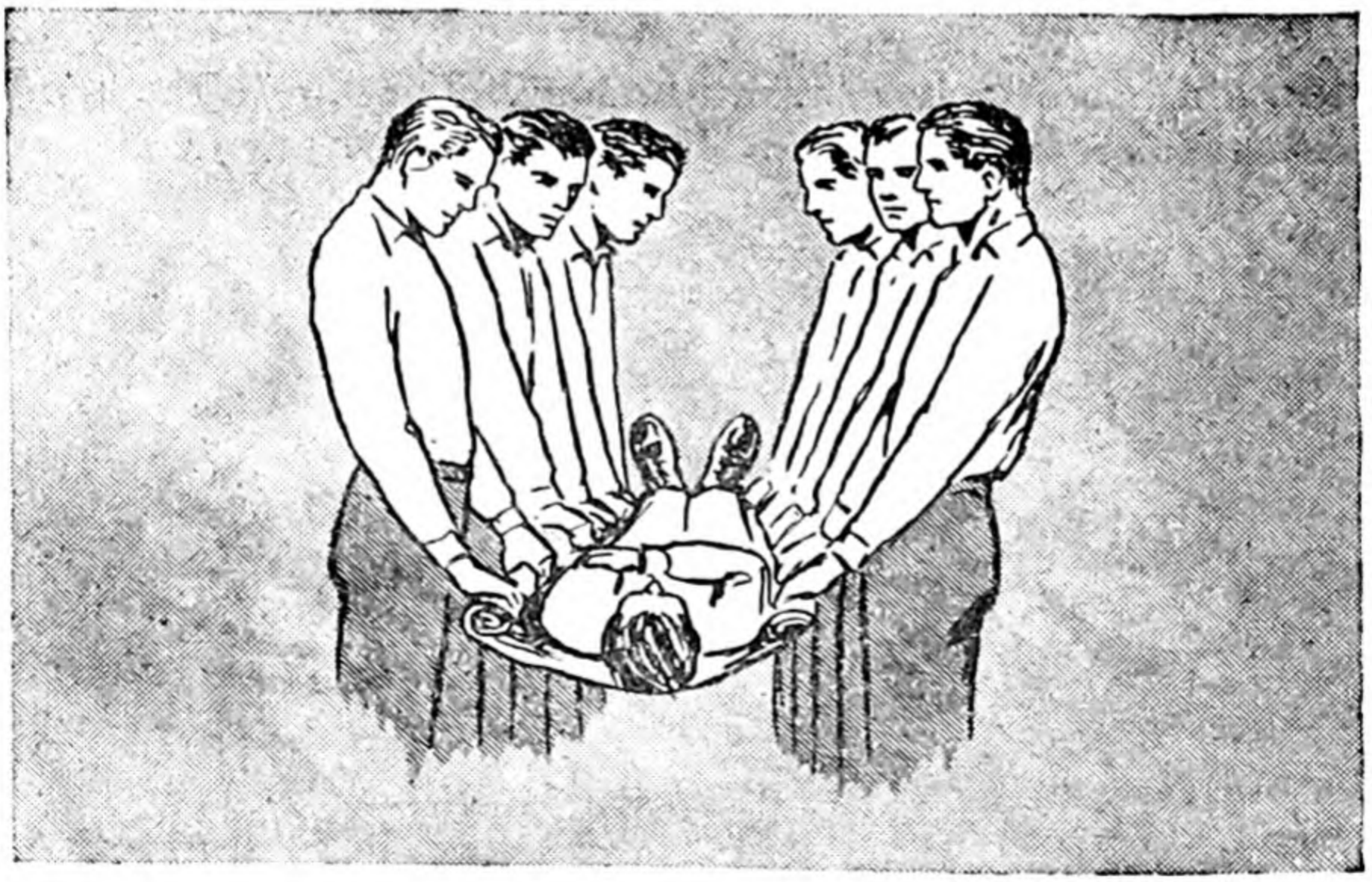


Figure 87

the center of the blanket, which may then be used to lift him on and off the stretcher. Two and preferably three bearers on each side are required (Figure 87).

WARNING: If the victim's neck is injured or broken he must be placed face up on a rigid stretcher; *do not use a blanket.* If his back is injured or broken, he must be carried face downward. A blanket may be used to place him on the stretcher. (See Fracture of Spine, pages 215-217.)

Arms Carries

Arms carries are used to load a seriously injured person on a stretcher when a blanket, rug, or similar equipment is not available. *However,* a person with suspected fracture of the spine *must not* be picked up and carried. He must be rolled or slid onto a rigid support, such as a door or board, which is then lifted to the stretcher. (See Fracture of Spine, pages 215-217.)

In arms carries, the desirable number of bearers is six or eight, with a leader to give the orders so that all movements will be carried out in unison. If the desired number of bearers is not available in an emergency, four or three bearers may be used.

Arms Carry with Six or Eight Bearers

1. Place the stretcher at the feet of the injured person.
2. At the command "Take posts," the bearers line up three or four on each side of the victim and kneel on the knee nearest the victim's feet (Figure 88, page 284).
3. The bearers on each side slip their hands under the victim's body until their fingers meet those of the bearers on the opposite side (Figure 89, page 284).
4. At the command "Lift," the bearers lift the victim to the level of their knees, and an extra helper slides the stretcher undet the victim between the two rows of bearers (Figure 90, page 285).

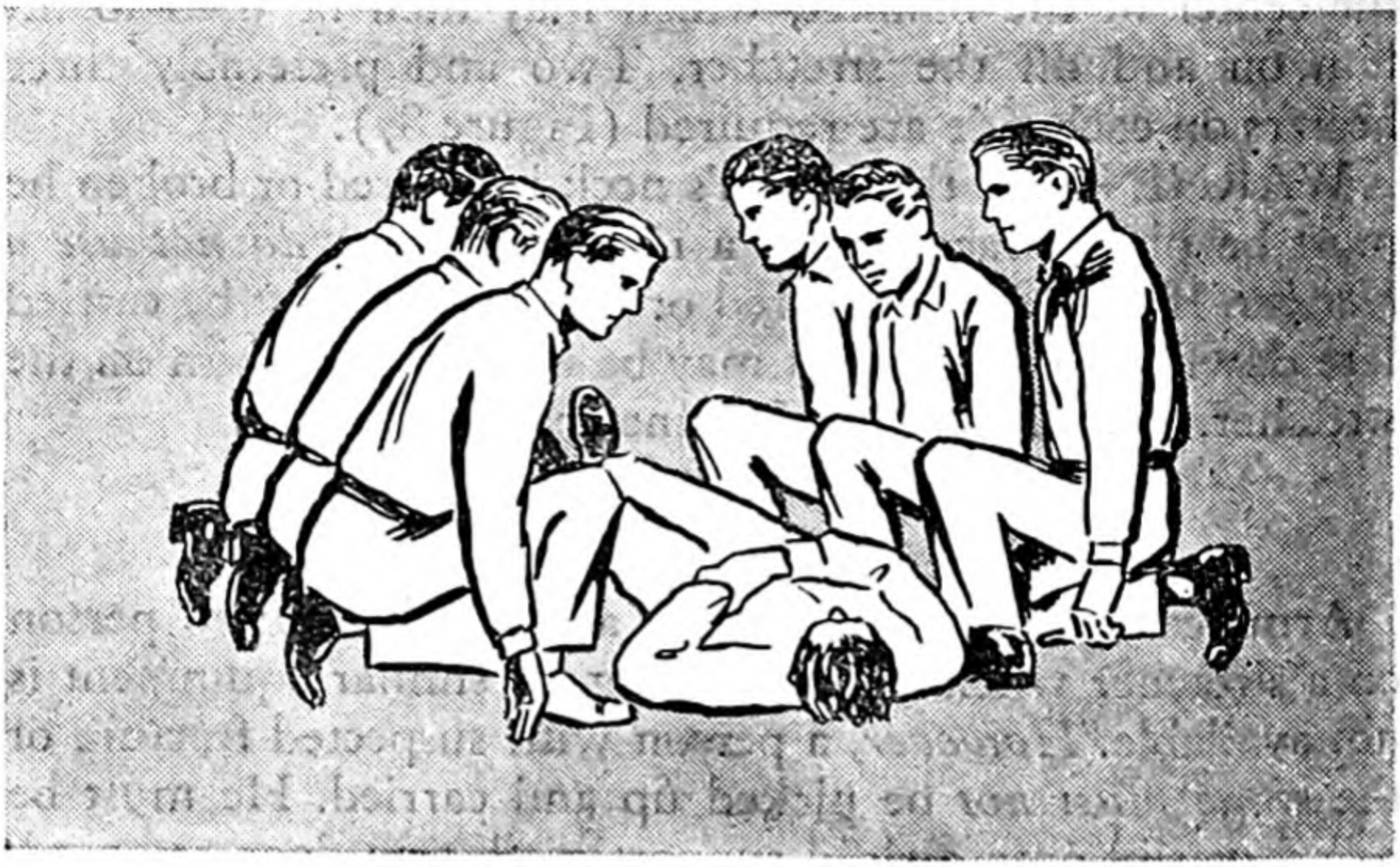


Figure 88

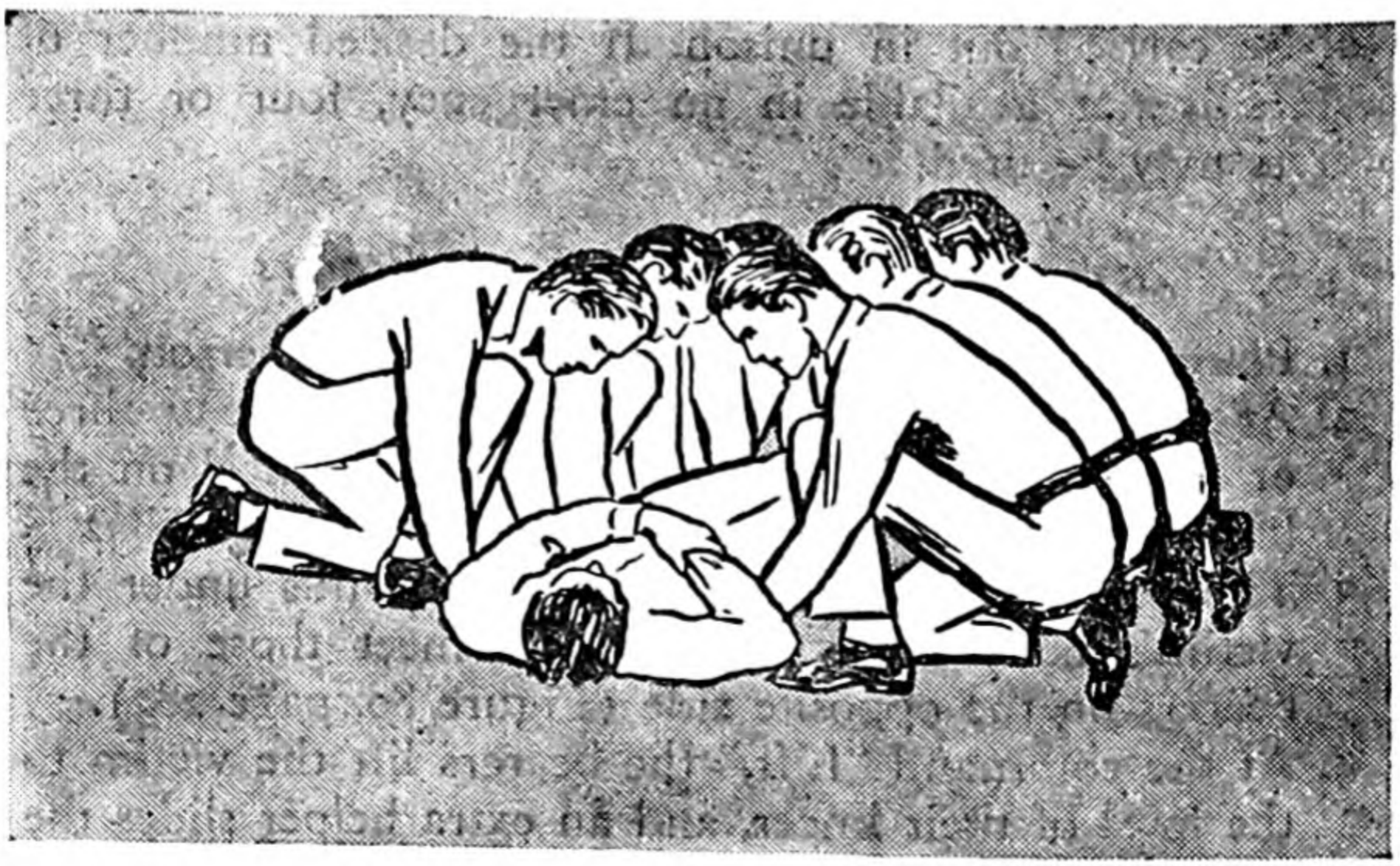


Figure 89

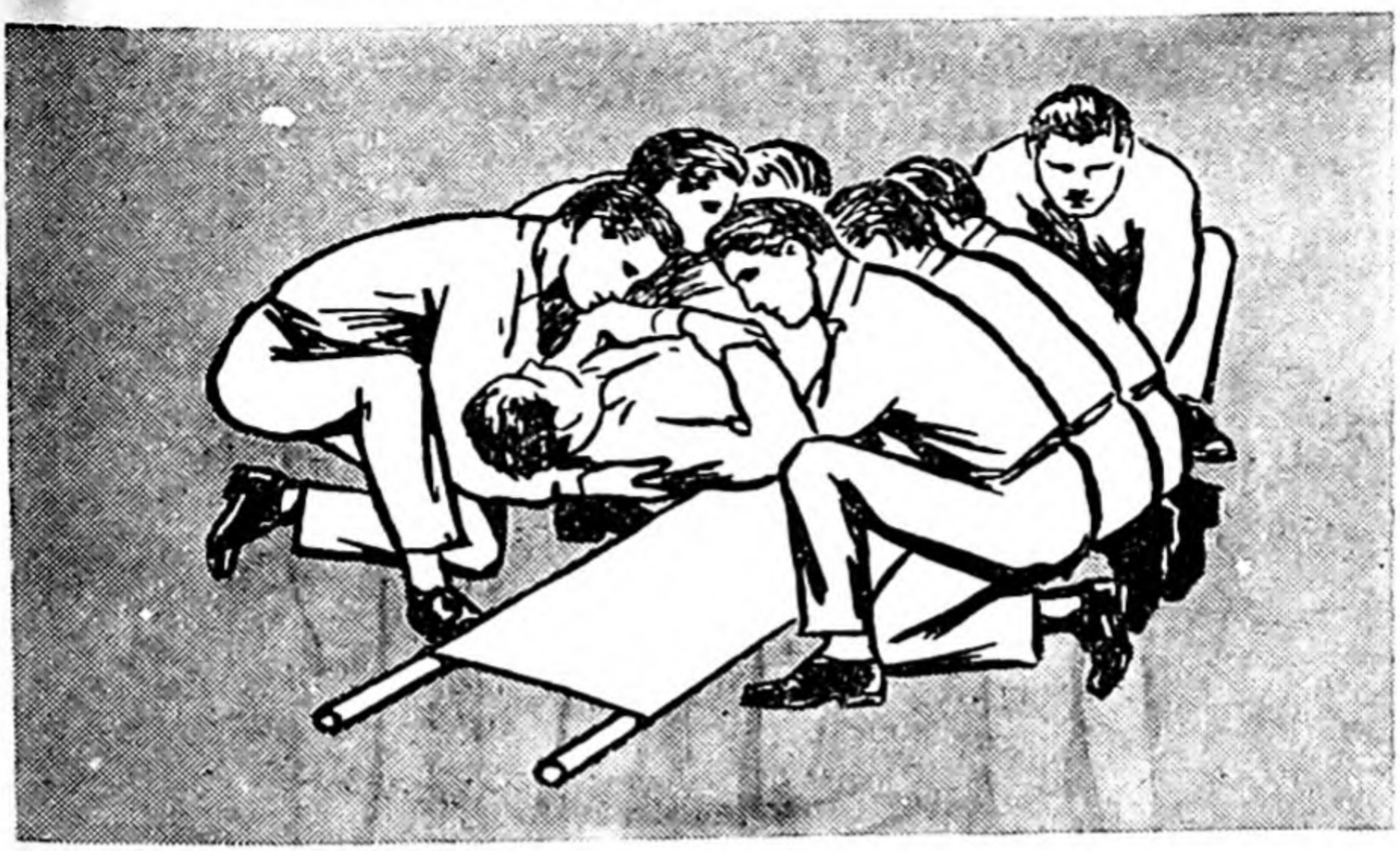


Figure 90

If no assistant is available to slide the stretcher under the victim, or if no stretcher is available and it is necessary to carry the victim for a short distance, the bearers on each side continue to lift the victim until all are standing and then side-step in the required direction. Upon reaching the stretcher, the bearers side-step to their positions on each side with the victim directly over it and then, kneeling all together, place the victim on it.

Arms Carry with Four Bearers

1. Place the stretcher near the injured person so that it can be obtained quickly.
2. At the command "Take posts," the bearers take their positions as follows: Three bearers stand on one side of the victim (the uninjured side if only one side is injured), one at the ankles, one at the hips, and one at the shoulders. The fourth bearer stands at the hips on the opposite side. All bearers face the victim (Figure 91, page 286).

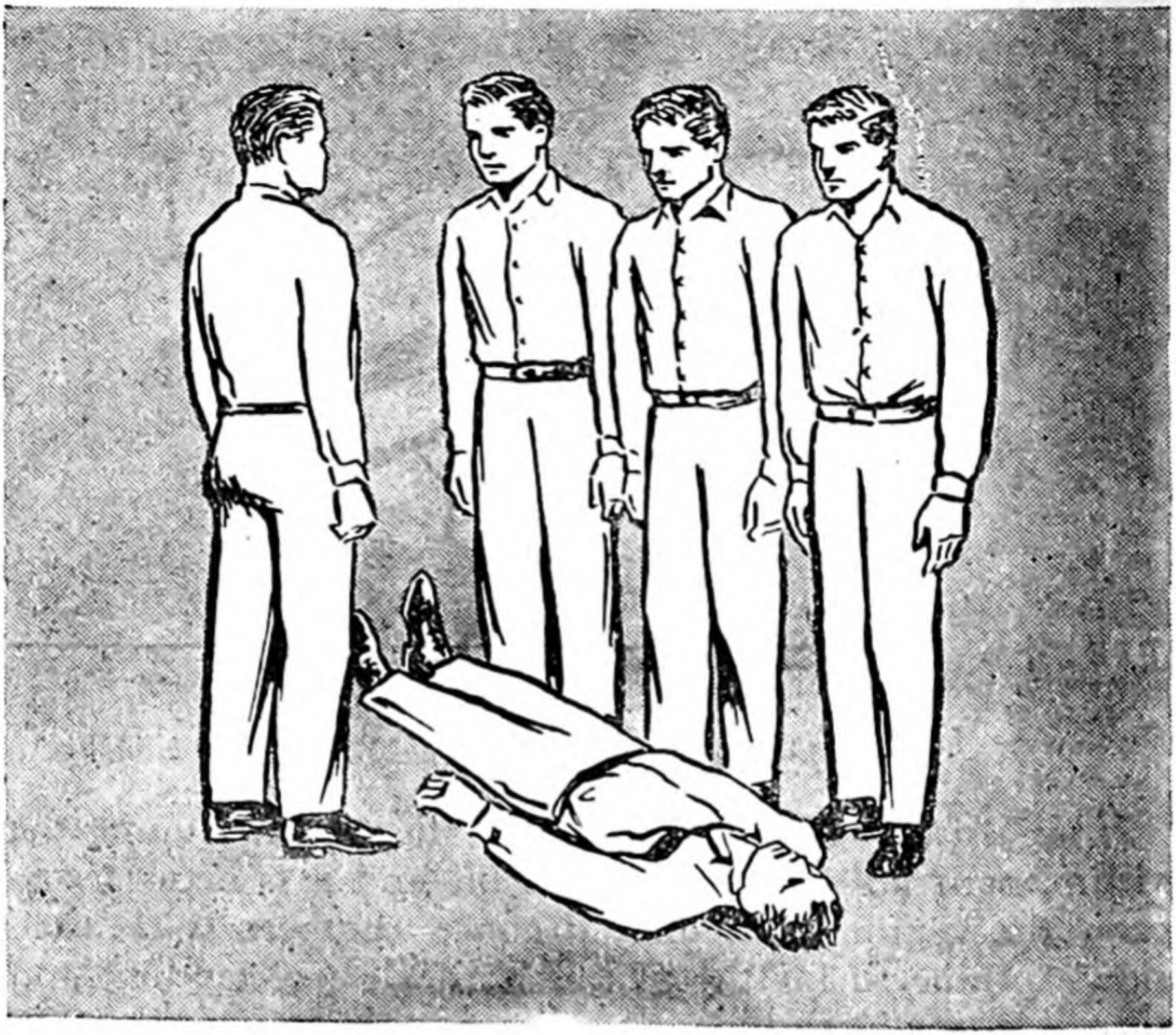


Figure 91

3. All bearers kneel on the knee nearest the victim's feet. The bearer kneeling at the ankles passes one forearm under the ankles and the other under the knees. The two bearers kneeling at the hips, facing each other, place their arms under the small of the back and the thighs respectively, not locking hands. The bearer kneeling at the shoulders passes one arm under the victim's neck, with his hand under the far shoulder, the other hand under the near shoulder.

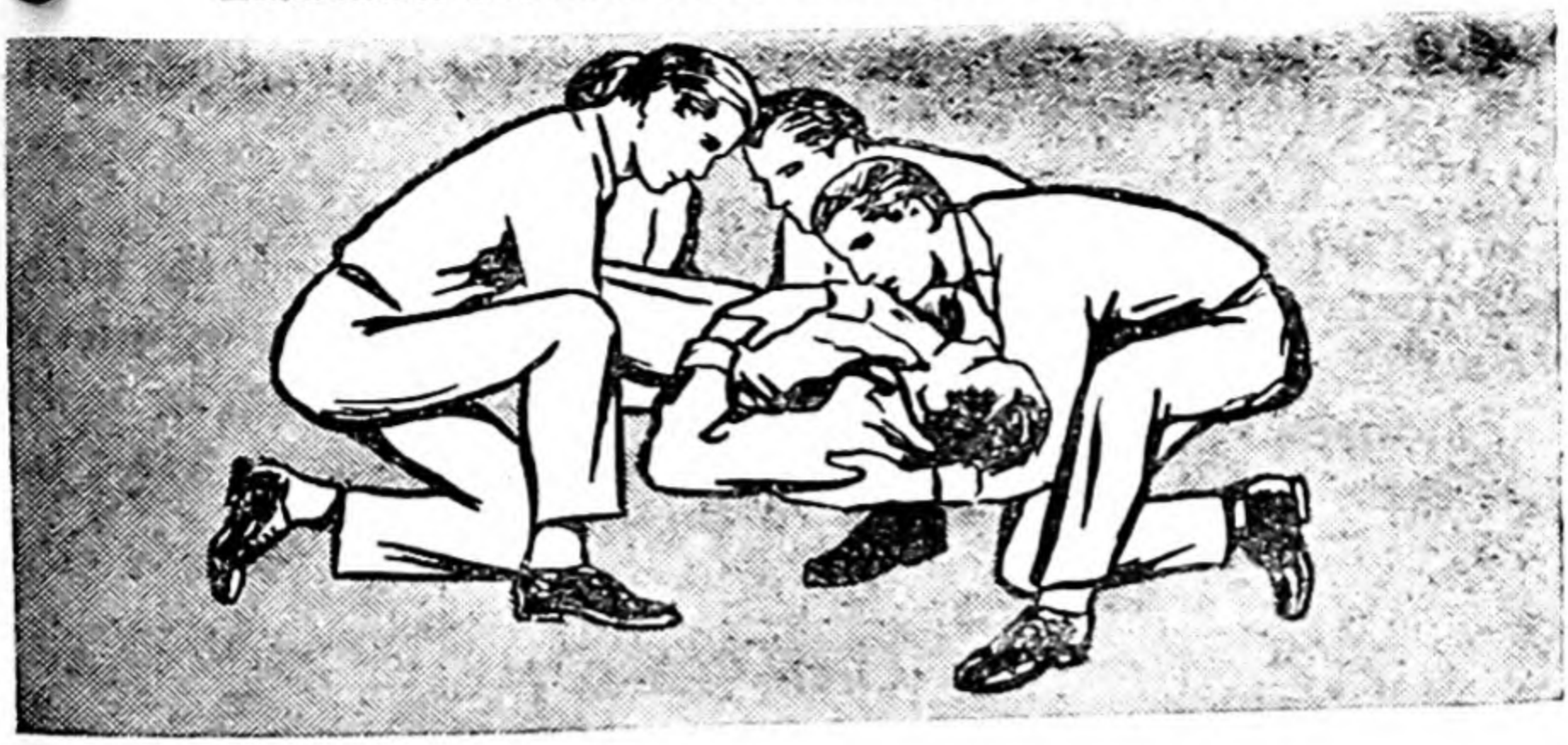


Figure 92

4. At the command "Lift victim," the bearers all lift together, slowly and carefully (Figure 92), and place the injured person upon the knees of the three on the same side. The free bearer then places the stretcher under the injured person and against the ankles of the other three bearers (Figure 93).

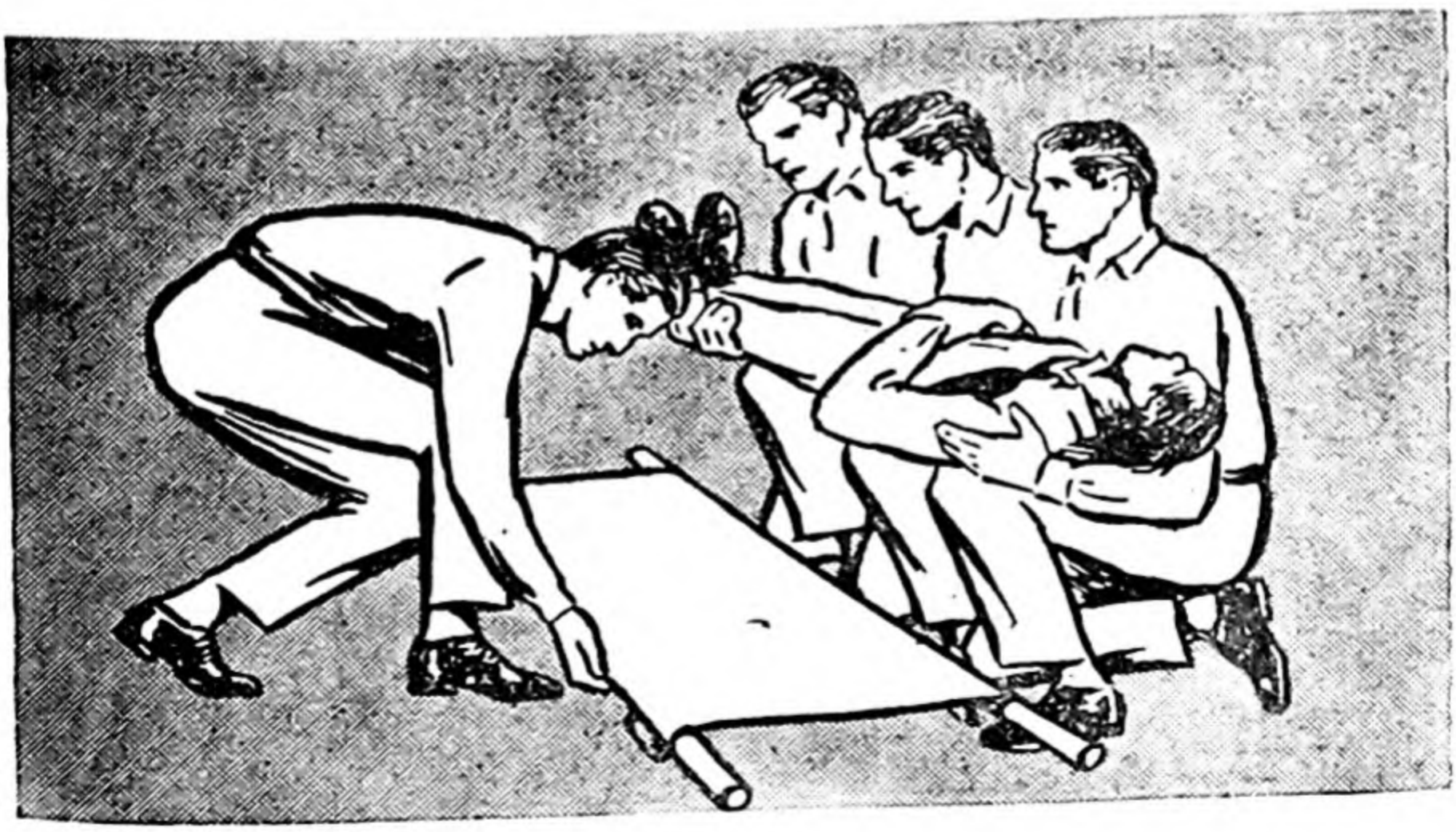


Figure 93

5. At the command "Lower victim," the injured person is gently lowered to the stretcher.

To remove the victim from the stretcher to a bed, the same commands are given and the same procedure followed except that the free bearer removes the stretcher from beneath the injured person instead of placing it under him when he has been lifted to the knees of the other three.

Arms Carry with Three Bearers

If only three bearers are available to load an injured person on a stretcher, two kneel on one side of the person, one at the ankles and the other at the shoulders, while the third kneels on the opposite side at the hips. The injured person, having been lifted by the three bearers, is supported on the knees of the two on the same side while the third places the stretcher in position and then helps to lower the victim on it (Figure 94).

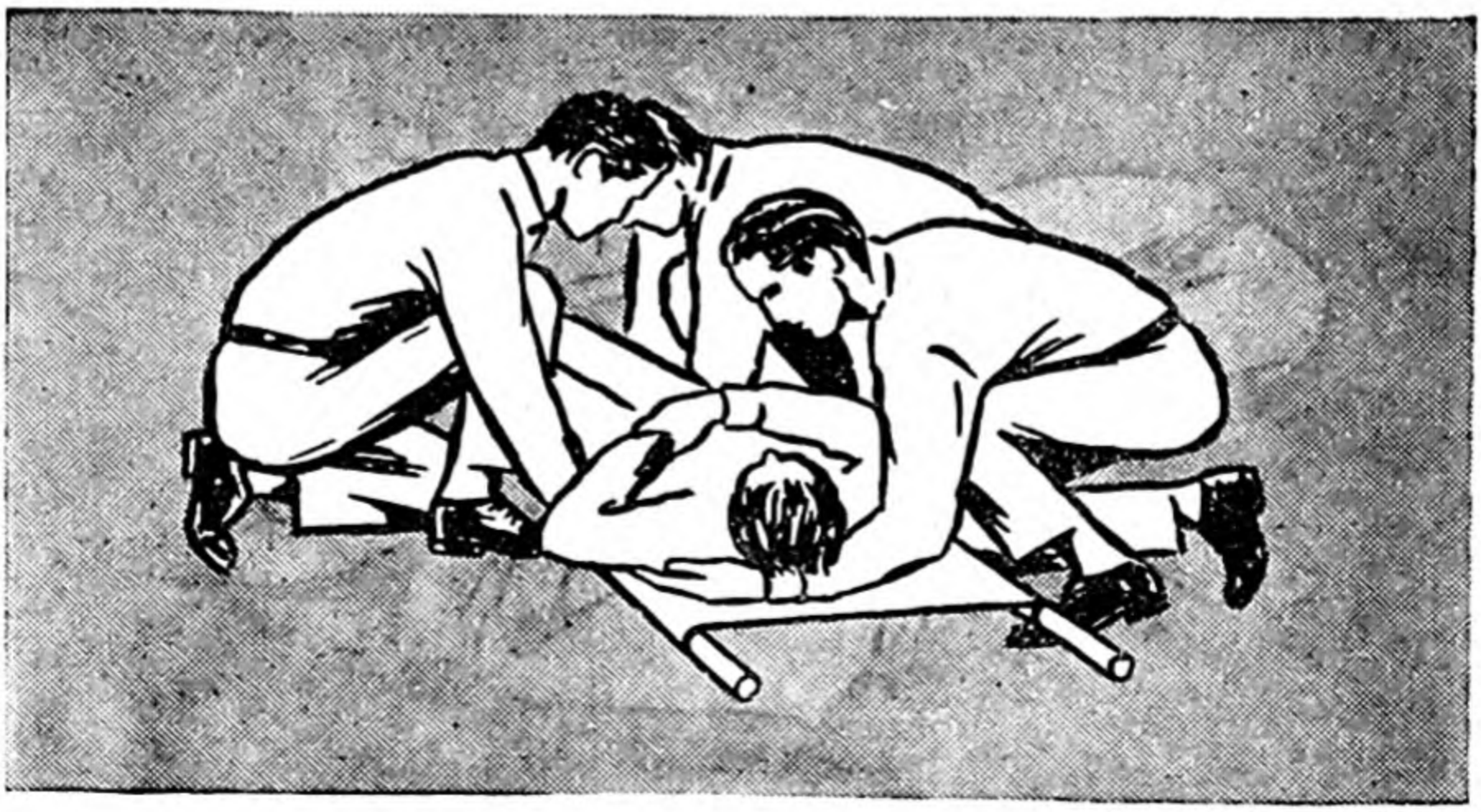


Figure 94

Carrying the Stretcher

In carrying a stretcher, the front bearer steps off with the left foot and the rear bearer with the right foot to keep the stretcher from swaying. The bearers on each side of the stretcher step off with the left foot and keep pace with the front bearer. All bearers take short, sliding steps to avoid jolting and to secure a uniform motion of the stretcher (Figure 95).

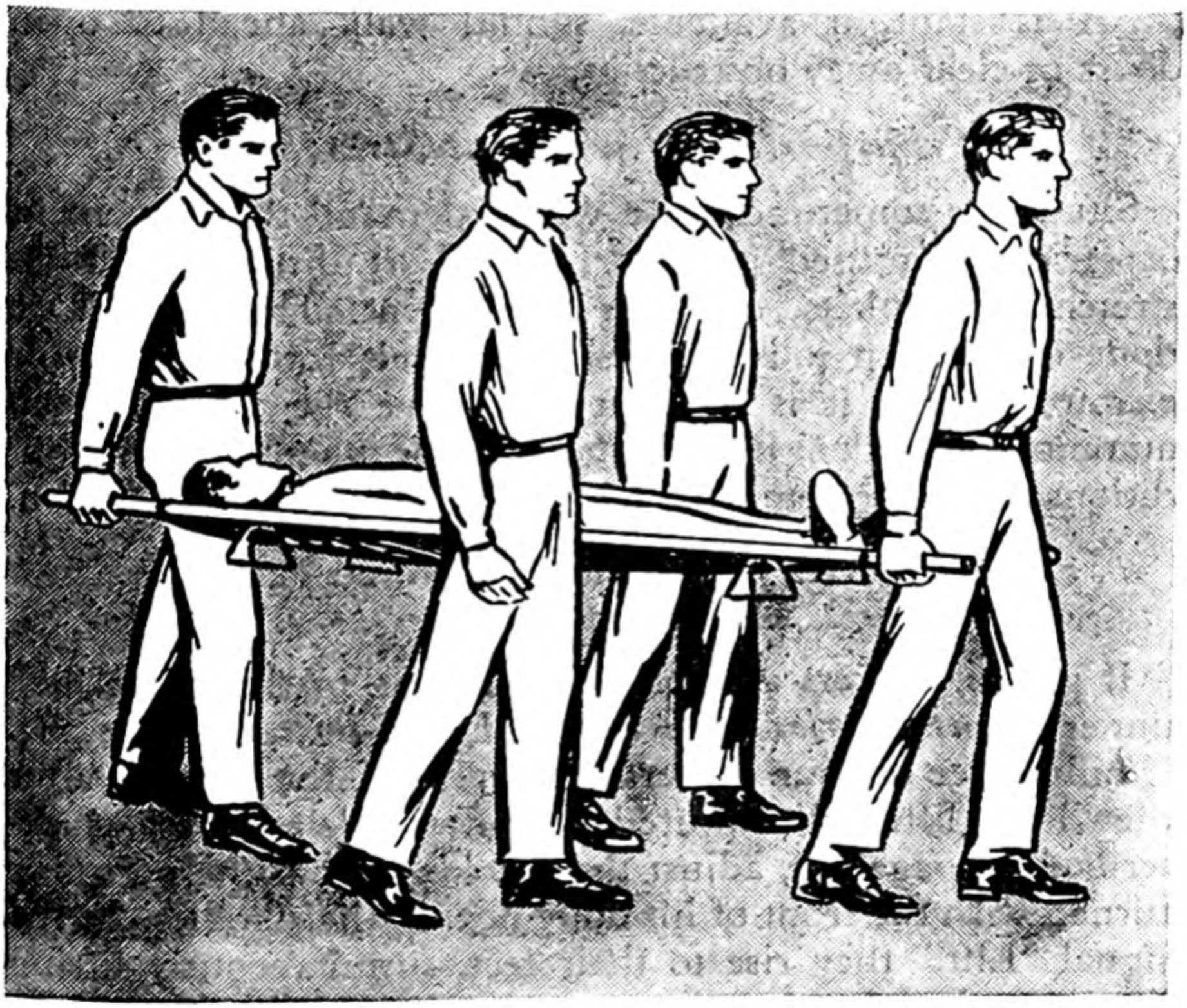


Figure 95

Every movement made by the bearers should be deliberate and as gentle as possible, especial care being taken not to jar the injured part.

As a general rule, an injured person should be carried on the stretcher feet first, but in going uphill or upstairs his head should be in front. In case of leg fractures, however, he is carried uphill or upstairs feet first and downhill or downstairs head first, to keep the weight of the body from pressing on the injured part. In carrying the stretcher up and down stairs or hills and in passing obstacles and ditches, the stretcher should be kept as level as possible unless the injured person is lashed to it.

An assistant, if available, should walk ahead to open doors or clear away obstructions.

Transportation Without Stretchers

Situations sometimes arise which demand the movement of seriously injured persons for a short distance without stretchers, blankets, or other equipment. This should be done only when it is impossible to wait for help—as, for example, when it is necessary to move the victim of an automobile accident off the highroad, or when weather conditions make it essential to get shelter for an injured person.

Arms Carries with Seriously Injured Person in Horizontal Position

If several bearers are available, use the method described under *Arms Carries with Six or Eight Bearers,* page 283. If only three or four bearers are available, the bearers, after they have lifted the injured person to their knees, as described on page 287, adjust their holds so that the person is turned with the front of his body next to their bodies. At the signal "Lift," they rise to their feet, simultaneously lifting the injured person in a horizontal position with his weight carried well up to lessen fatigue (Figure 96). The bearers then step off with the left foot and keep step. If the victim must be carried through a narrow passageway, the bearers use the side step. Another person, if available, should walk ahead to open doors and clear away obstructions.

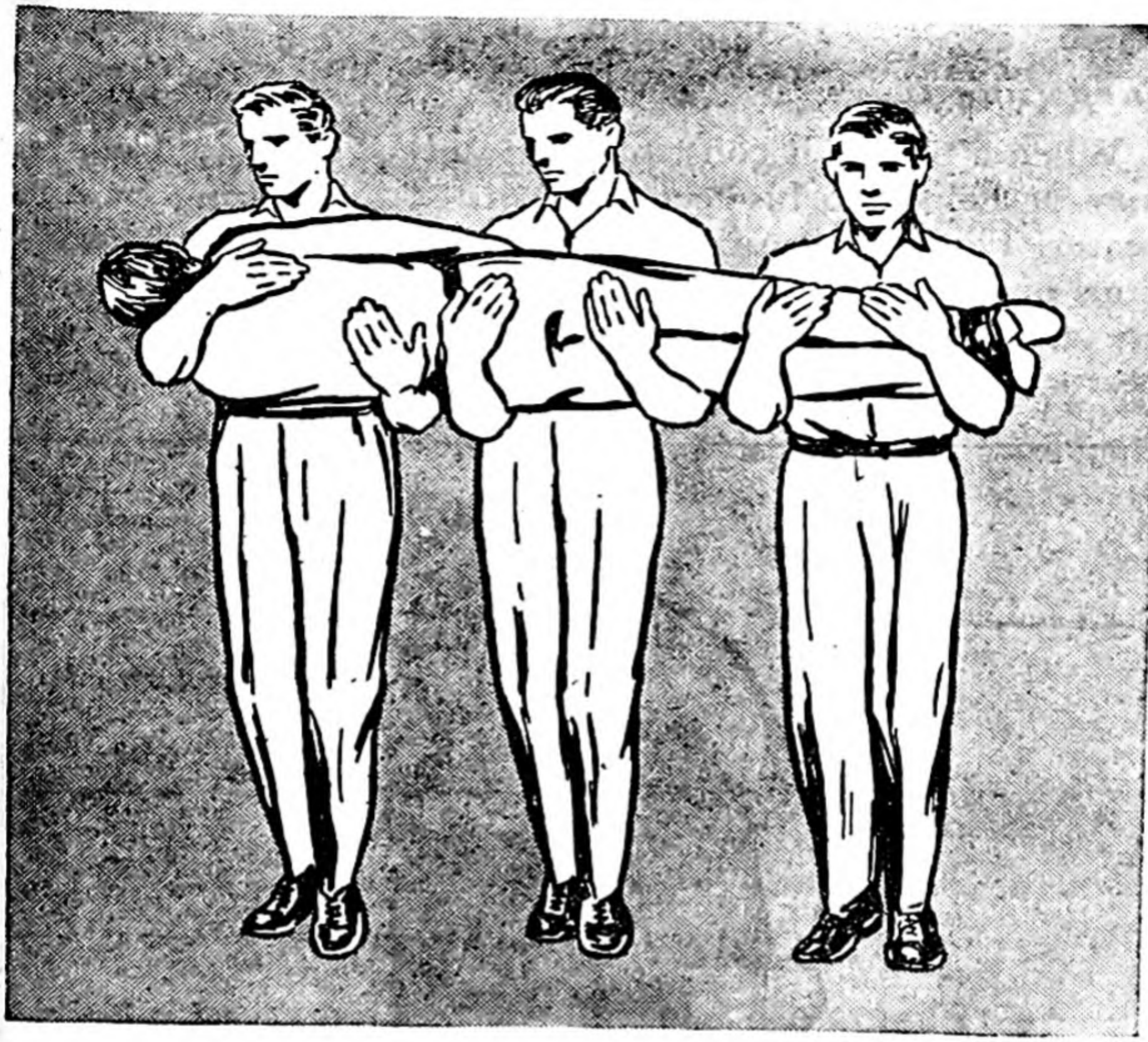


Figure 96

Arms Carries for Patients Not Seriously Injured

For persons who have not suffered serious bodily injury, but must be carried because they are unconscious or because walking would aggravate their condition, the following one-man and two-man carries may be used. The selection of the method depends upon the nature of the disability and upon the distance the victim must be carried. The method which is best for the injured person and least tiring for the bearer should be selected.

One-Man Carries

Supporting Carry

When a person is conscious and only slightly injured, he may be helped to his feet and assisted in walking by one bearer. This help is called the "supporting carry." The positions of injured person and bearer in the supporting carry are as follows: The victim has his left arm around the bearer's neck with the wrist held by the bearer's left hand.

Figure 97

The victim's body rests against the right side of the bearer's body, and the bearer's right arm is placed around the victim's waist for support. The victim then walks assisted by the bearer (Figure 97). If it is easier to support the person against your left side, substitute left for right and right for left in the instructions.

Arms Carry

A conscious or unconscious person may be lifted and carried for a short distance in the arms of one bearer, provided his injuries do not prohibit this method of transportation. The procedure is as follows:

1. Turn the victim on his face and straddle his body, facing his head (Figure 98).

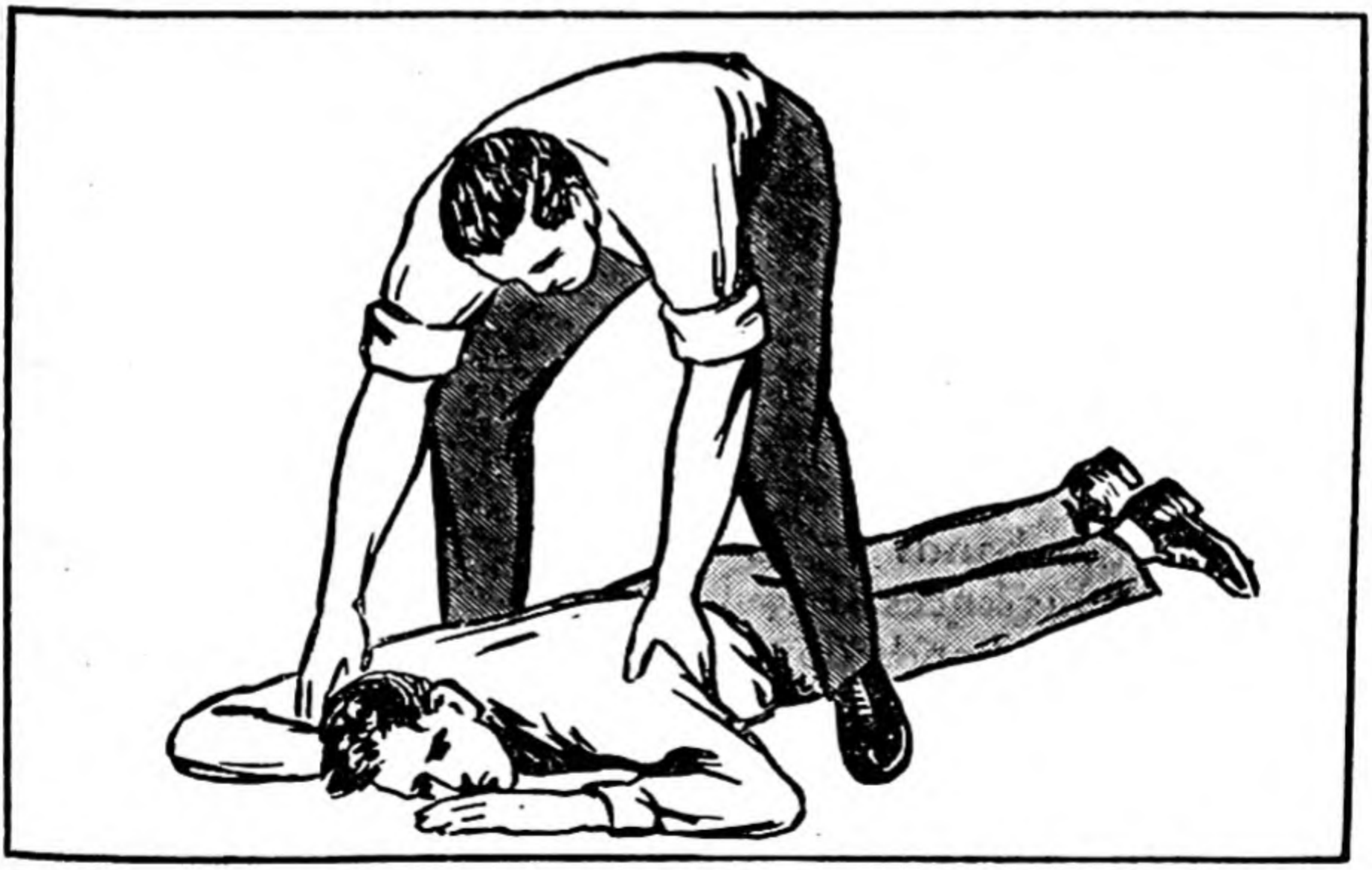


Figure 98

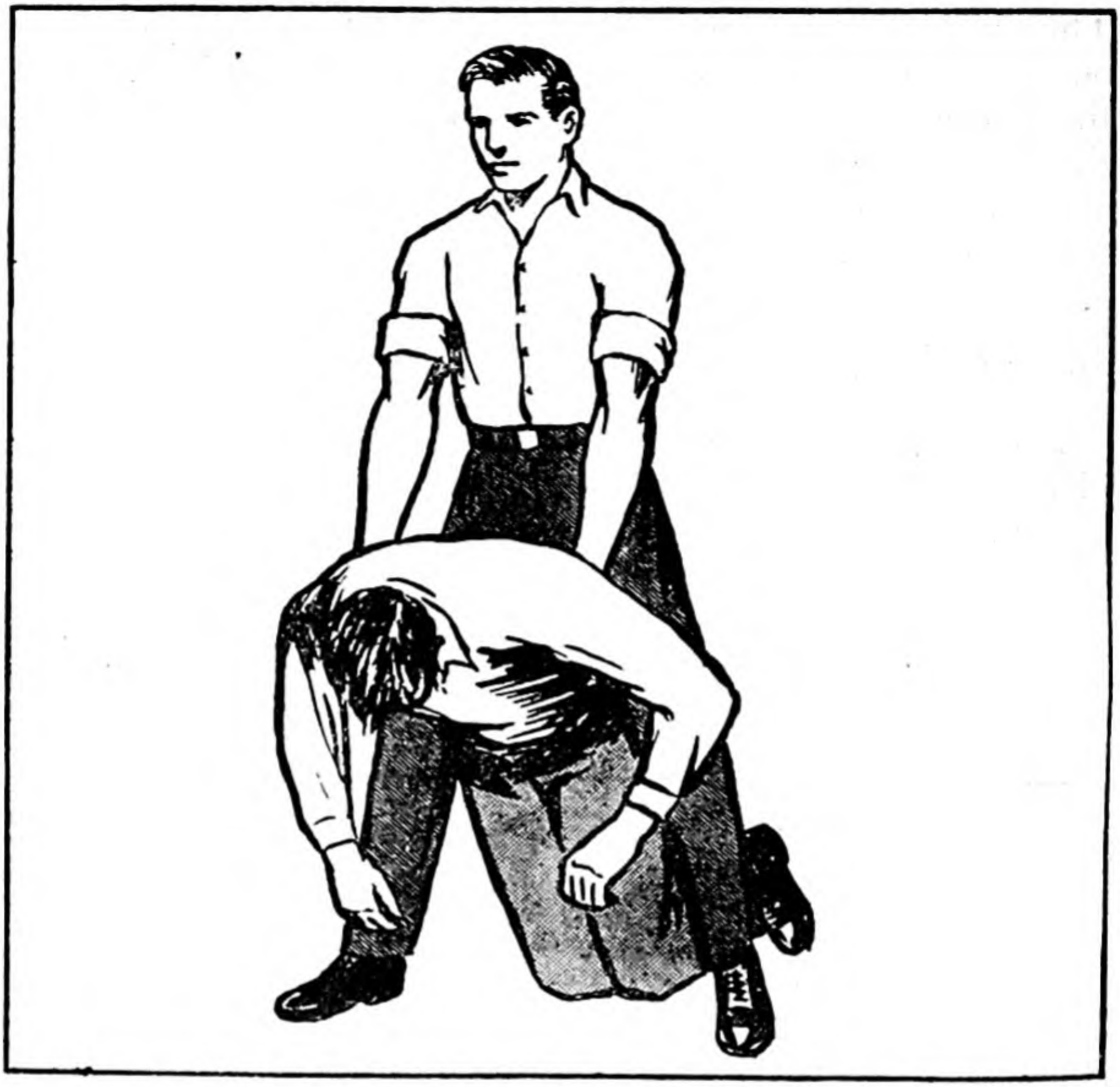


Figure 99

2. Put your hands under the victim's armpits and raise him to his knees (Figure 99).
3. Slide your hands down to clasp the victim around the waist and raise him to his feet (Figure 100).

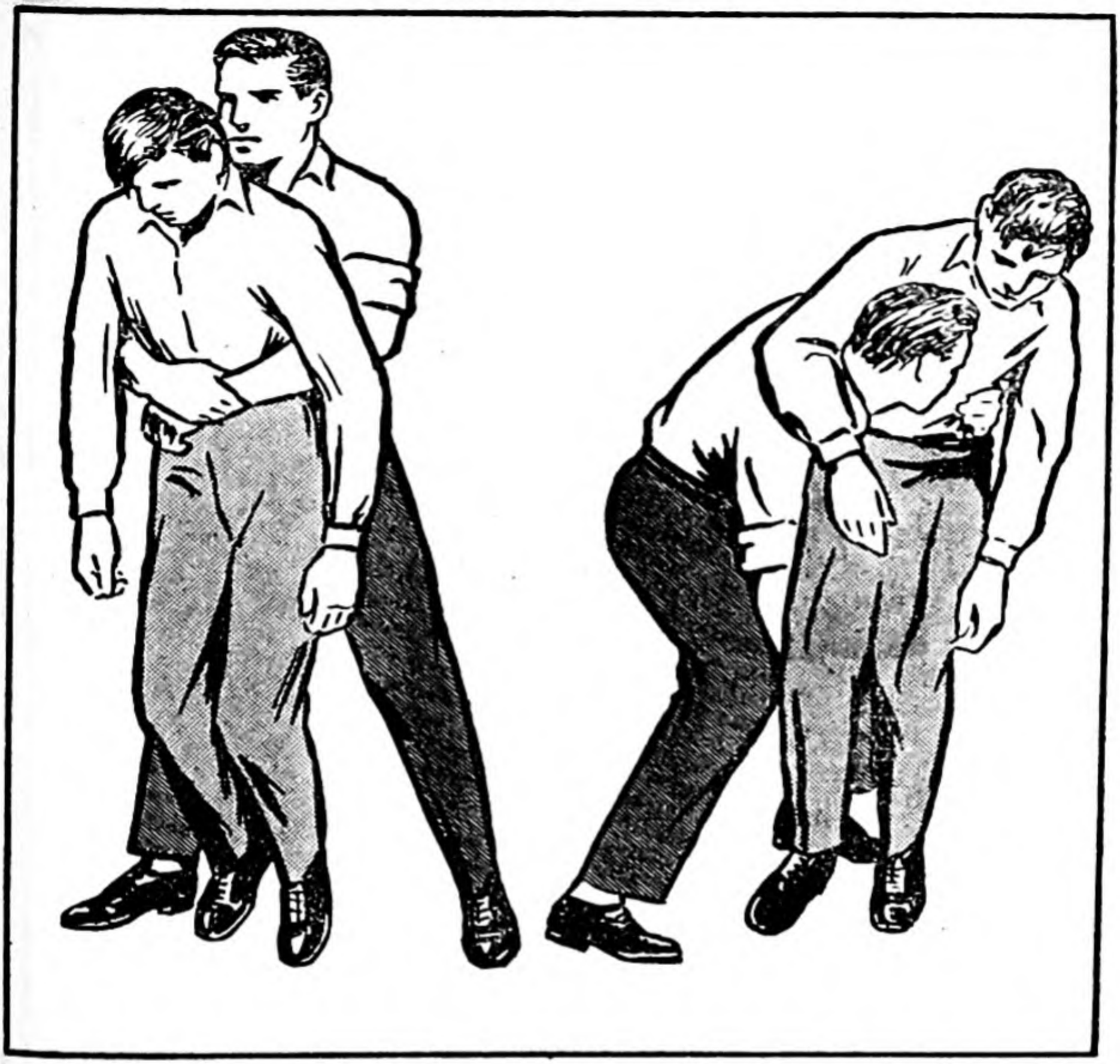


Figure 100 Figure 101

4. Slide one arm upward to support the victim's back and pass your other arm under the victim's knees (Figure 101).
5. Lift the victim to a carrying position, as high as possible to lessen fatigue (Figure 102, page 296).

Figure 102

Fireman's Carry

This is the carry preferred for the movement of an unconscious person by one bearer. The procedure is as follows:

1. Bring the person to his feet by taking the first three steps described in the arms carry (see Figures 98, 99, and 100, pages 293-295).

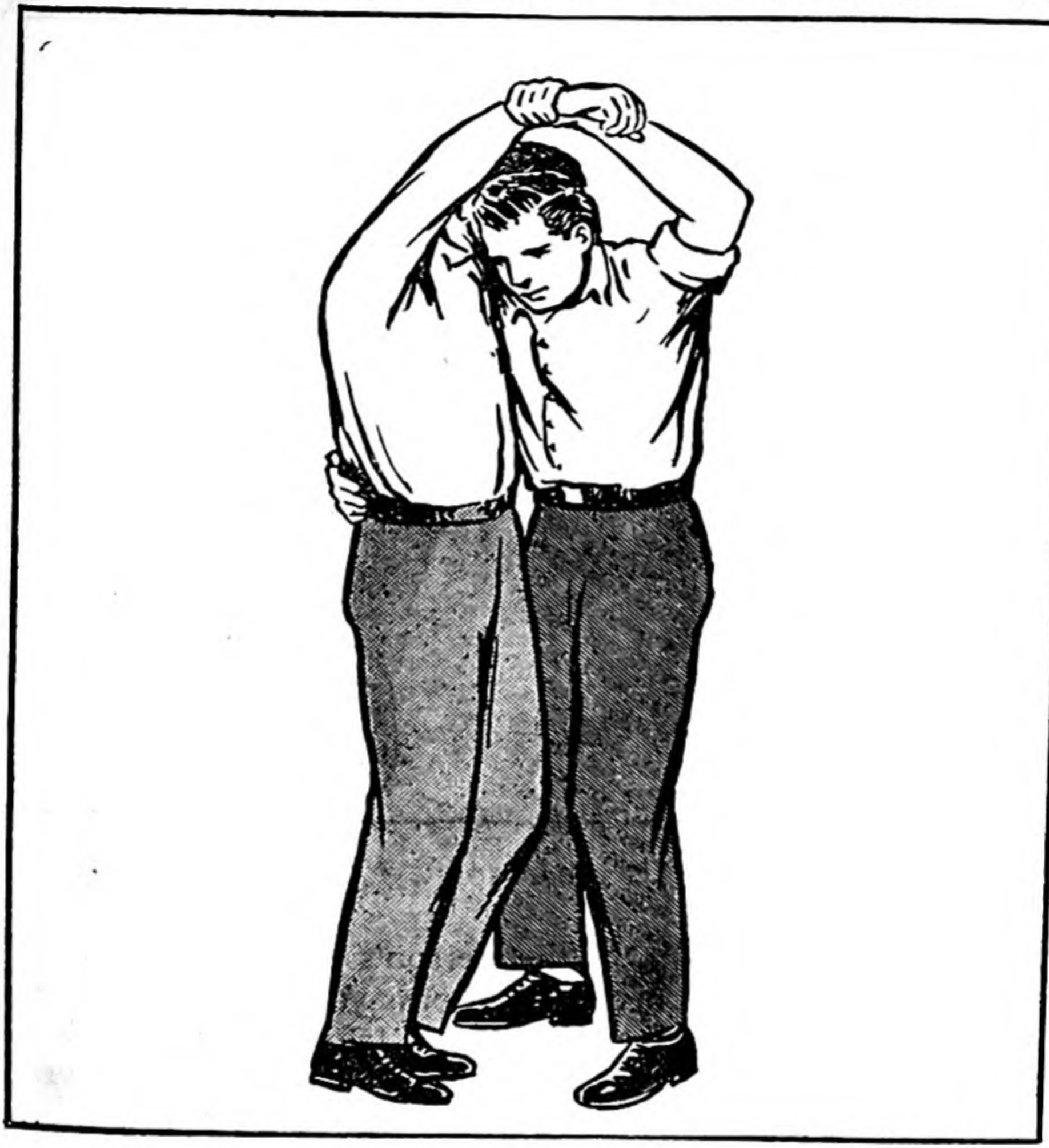


Figure 103

2. From your position behind the person step slightly to his left, grasp his right wrist with your left hand, and pull upward (Figure 103).

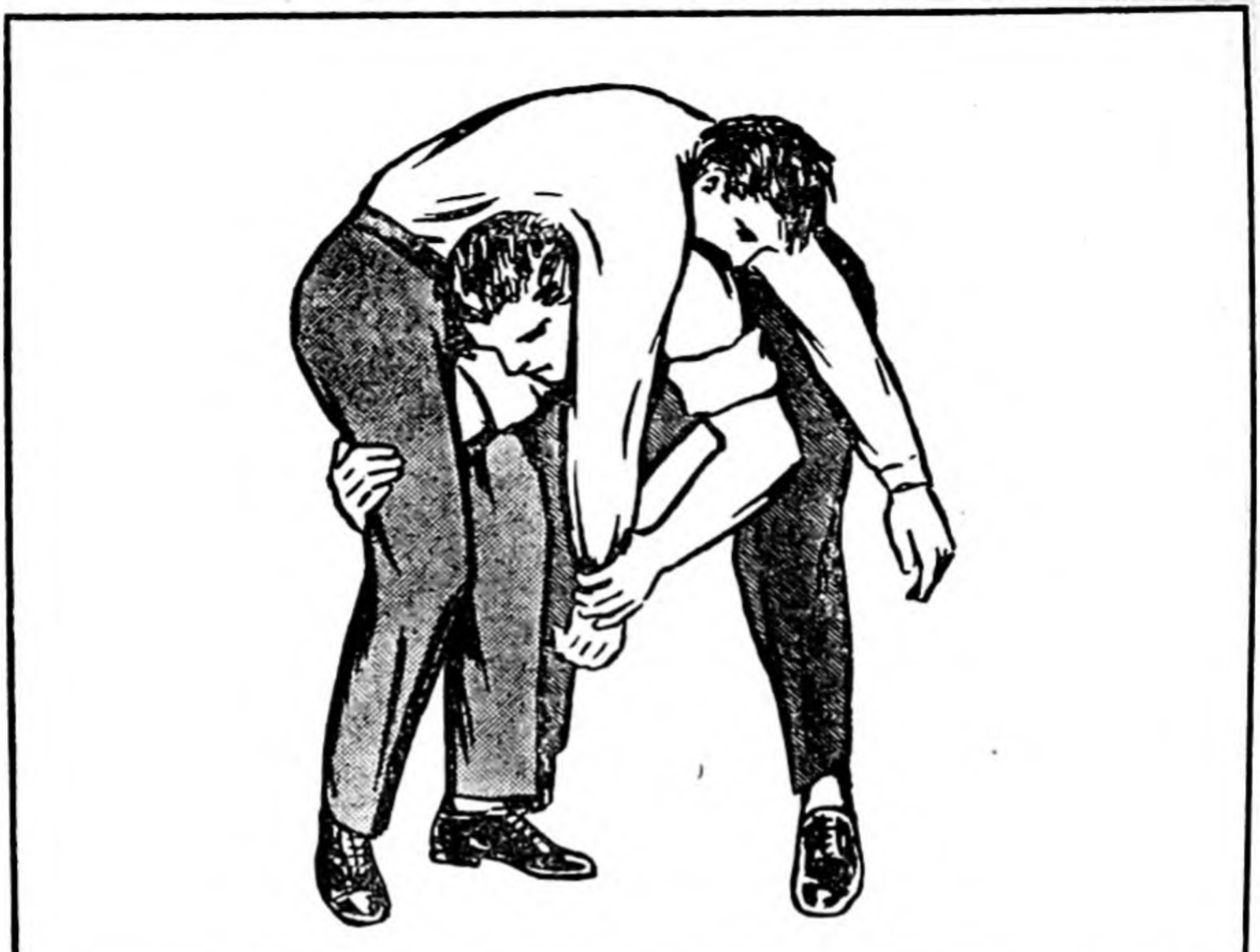


Figure 104

3. Stoop over and bring the person's right arm around the back of your neck. Then pass your right hand between the thighs and draw the trunk over your left shoulder (Figure 104) by pulling the right arm downward with your left hand.

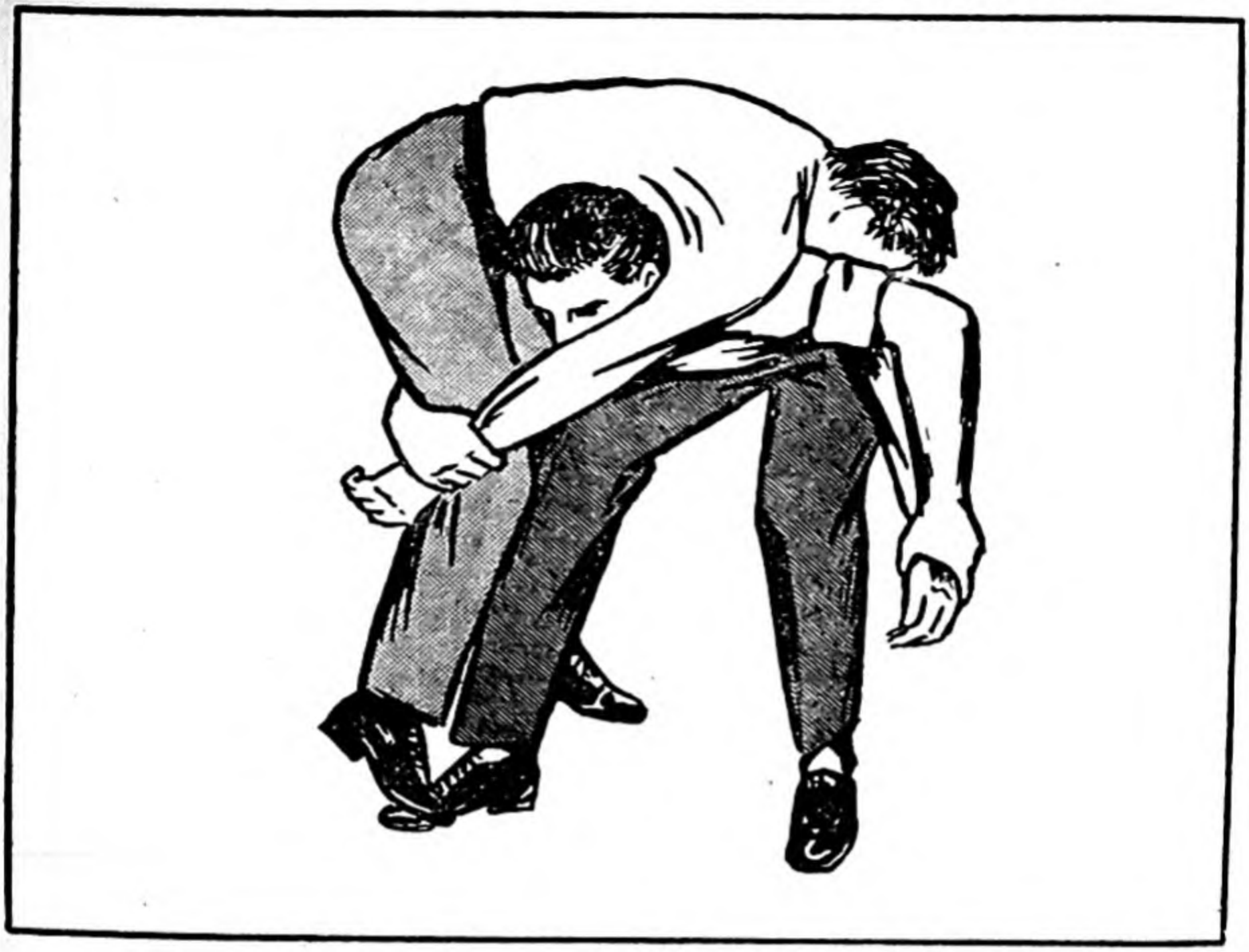


Figure 105

4. Shift your grip on the person's right wrist from your left hand to your right hand (Figure 105) and with

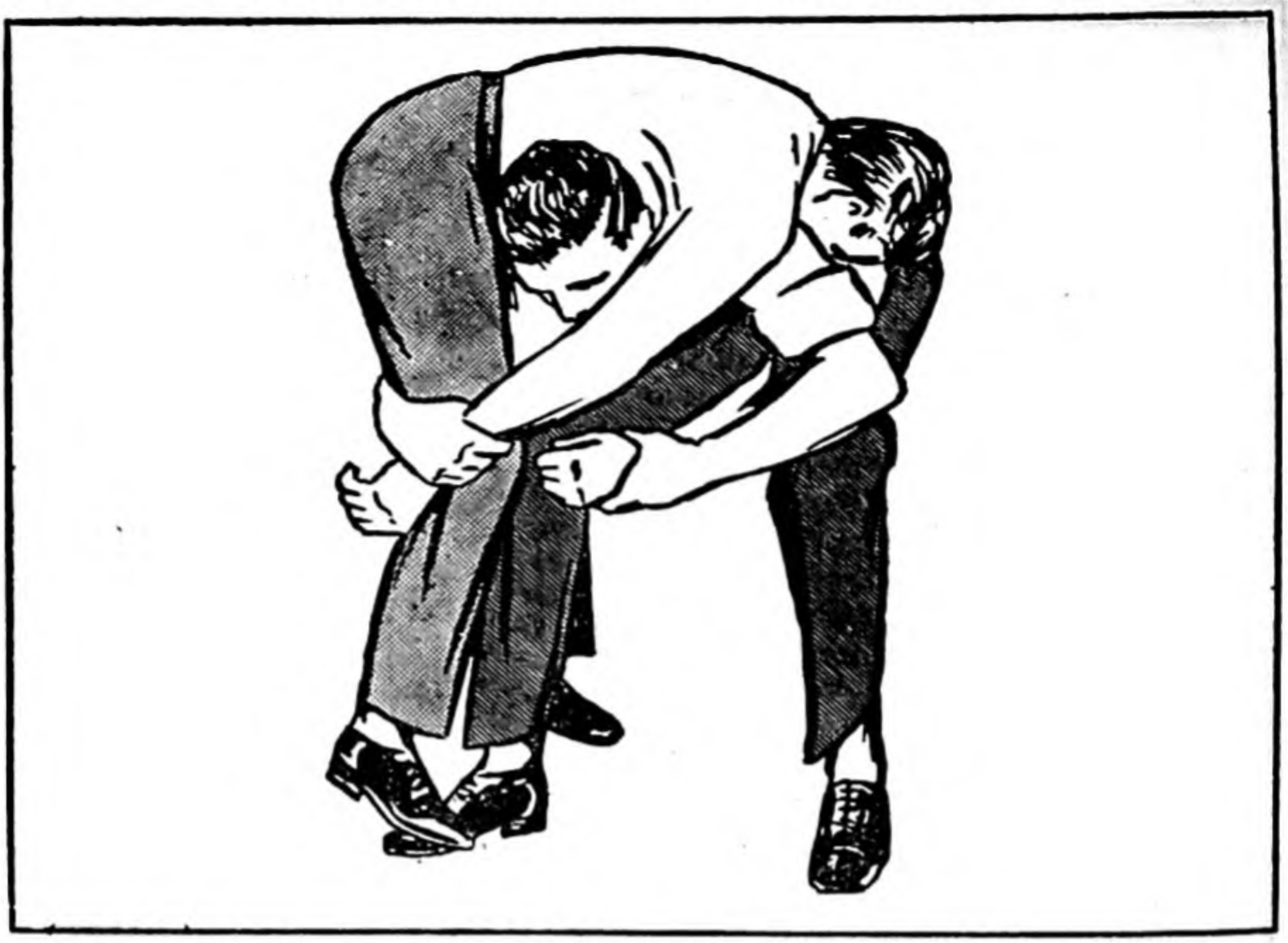


Figure 106

your released left hand reach backward and, grasping the person's left wrist, draw the left arm forward and across your chest (Figure 106).

5. Straighten up, after balancing the person's body so that the weight is evenly distributed (Figure 107, page 301).

Figure 107

To lower the injured person to the ground, kneel on your left knee, reach with your left hand to grasp the person's left knee, and slide the person around in front, down your left thigh into a sitting position (Figure 108). Then

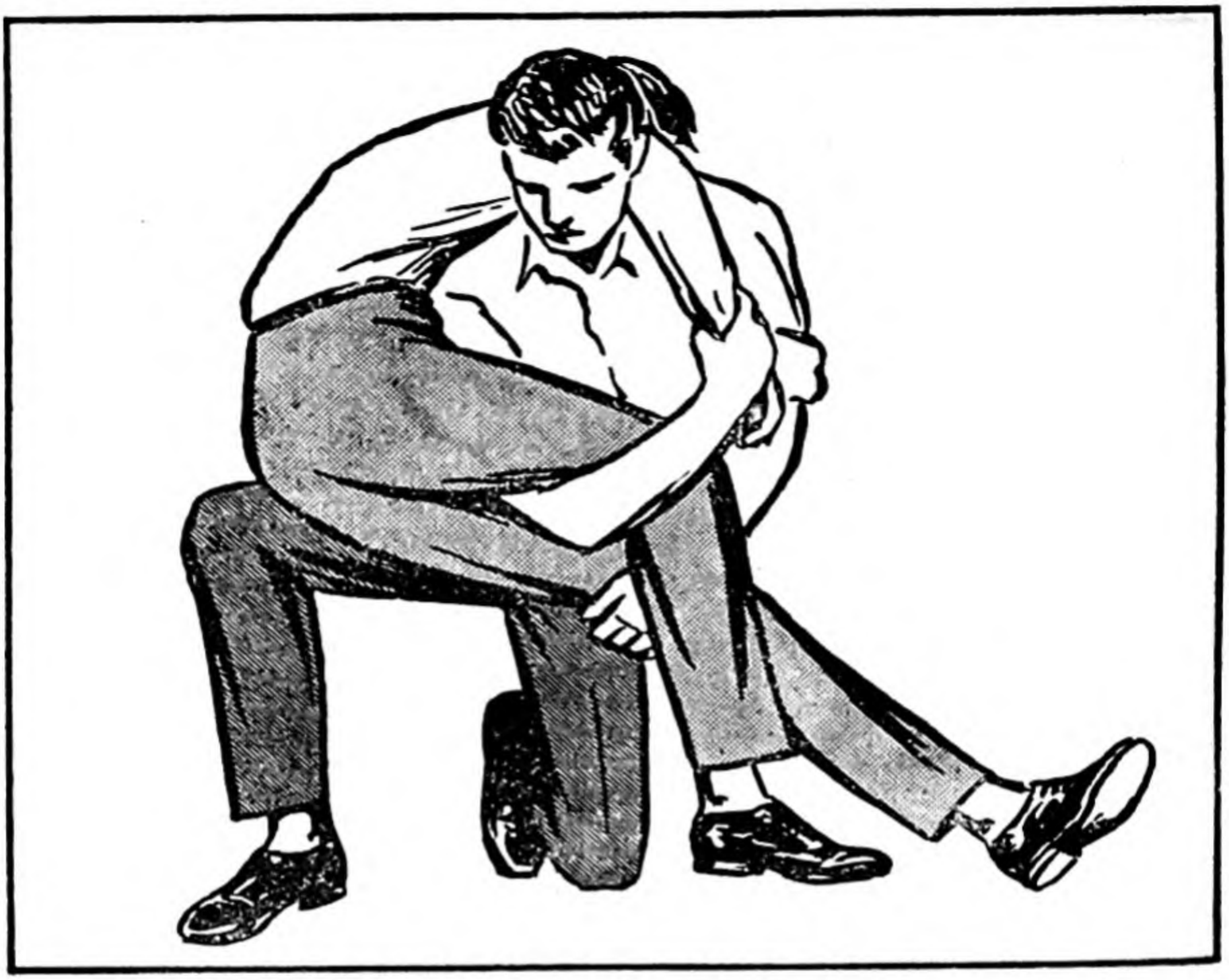


Figure 108

shift your hands to the person's head and ease him down on his back. Take care not to let the person's head hit the ground. If it is easier for you to use your left shoulder instead of your right in the Fireman's Carry, substitute left for right and right for left in the directions.

Saddleback Carry

This carry is what children call riding "piggyback." If the injured person can stand for a moment without help, stoop in front of him and raise him upon your back by pulling on his arms placed over your shoulder. Have him encircle your neck with his arms and place your arms under his thighs.

Figure 109

If the person cannot co-operate to this extent, lift him to his feet by taking the first three steps described for the arms carry (see Figures 98, 99, and 100, pages 293-295).

Then place the person's right arm around your neck and over your shoulder with your right hand and hold it there. Step quickly in front of him, stoop over and grasp his left wrist with your left hand. Then raise the person to your back by pulling on his arms. Cross his arms over your chest and hold them by grasping his wrists (Figure 109, page 303).

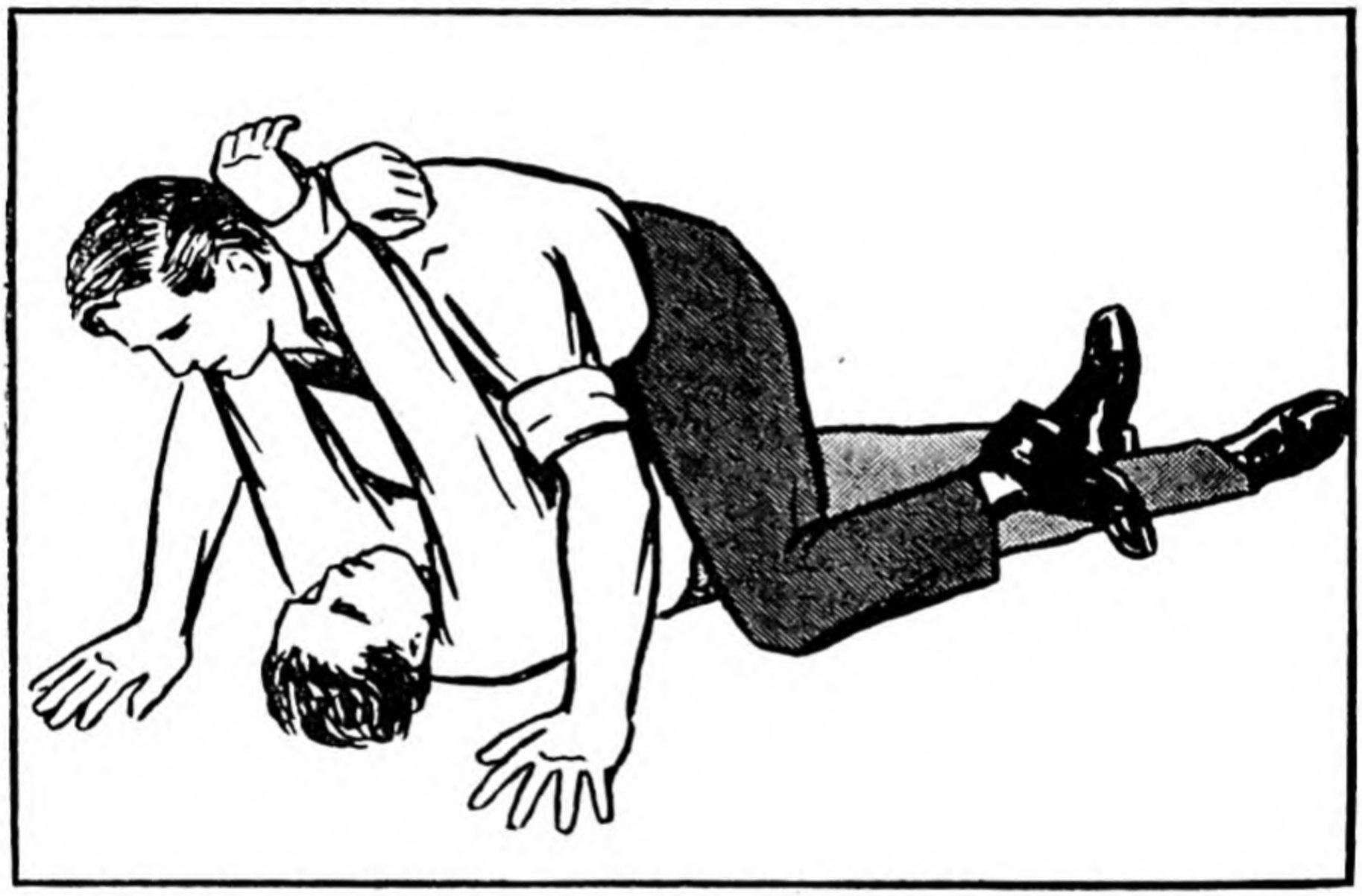


Figure 110

Fireman's Drag

This carry is very useful in rescuing a person who has been overcome by smoke or gas. Place the victim on his back and tie his wrists together with a cravat bandage. Then straddle the victim and pass your head between the loop formed by his arms. Raise his head and shoulders just off the floor and crawl dragging the victim with you (Figure 110). Another method is to crawl with the victim on your back after having tied his wrists together and passing your head through the loop formed by his arms. When you have reached a place where you can stand erect, you may carry the victim "piggyback."

Two-Man Carries

Supporting Carry

When two bearers are available to assist a conscious person in walking, have him put one arm around the neck of each bearer. Each bearer then grasps the hand resting on his shoulder and passes his free arm around the injured person's waist.

Fore and Aft Carry

This carry *cannot* be used to transport persons with broken bones or severe wounds. It is useful for carrying a person who cannot make any effort to assist the bearers, as in fainting or similar conditions.

The person is placed on his back. The front bearer steps between his legs, facing the feet. He then kneels and thrusts his arms under the person's knees.

The rear bearer kneels at the person's head, facing the feet, and thrusts his arms under the person's armpits and across the chest.

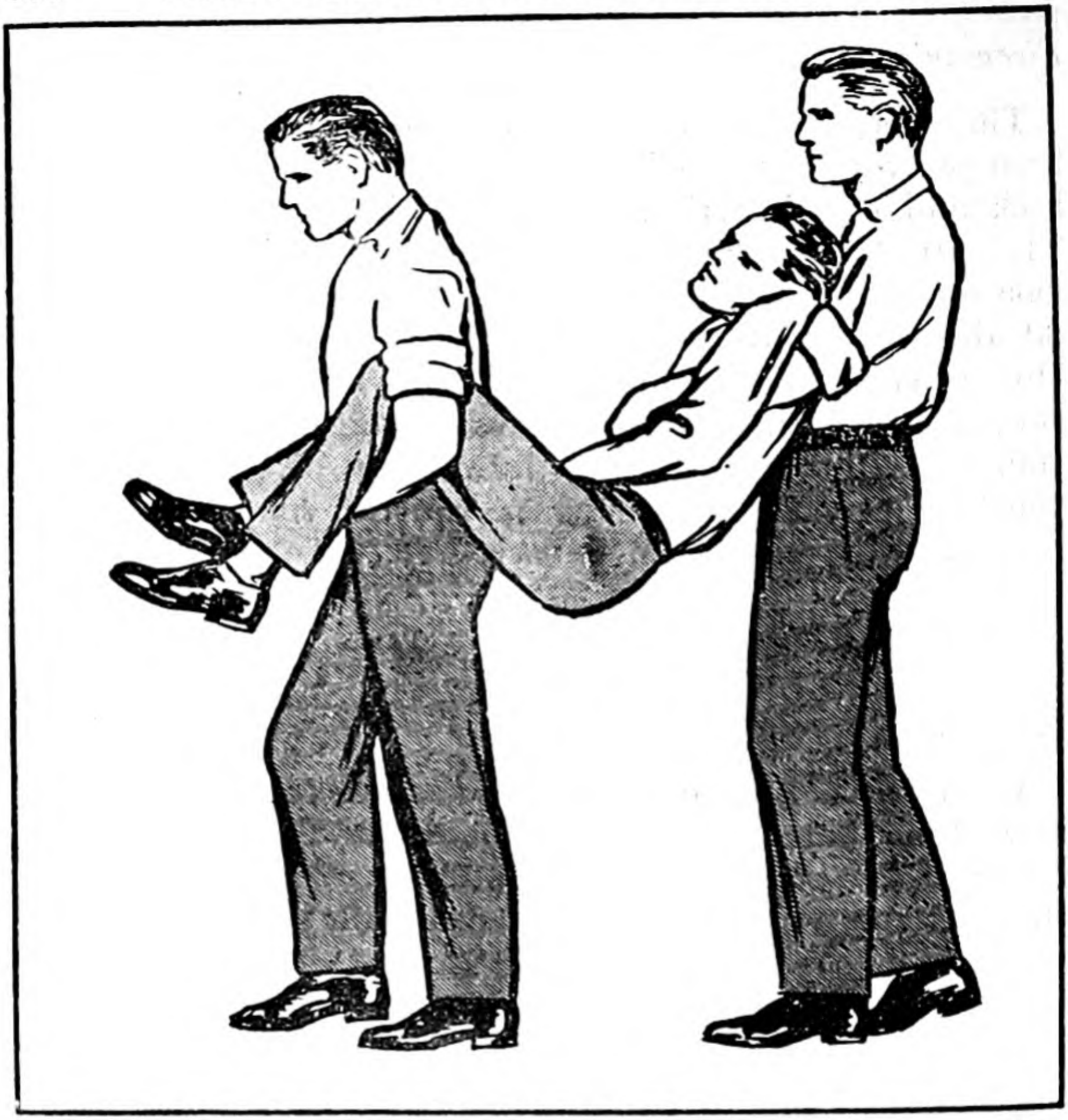


Figure 111

Both bearers rise at the same time, lifting the person in a semirecumbent position (Figure 111).

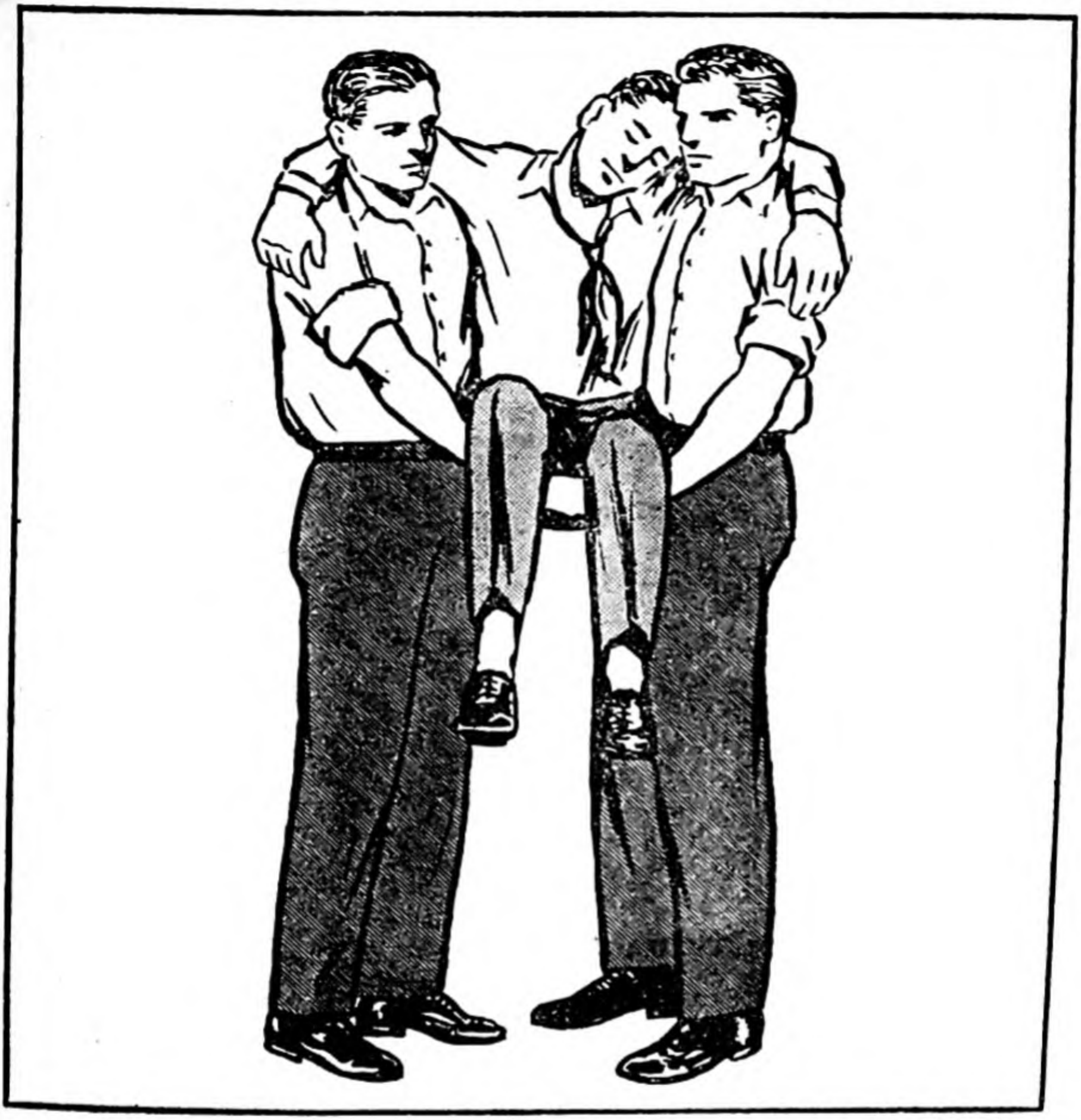


Figure 112

Two-Handed Seat Carry

The bearers kneel one on each side of the injured person near his hips and raise him to a sitting position. Each bearer then passes one arm around the person's back and the other arm under the thighs (Figure 112). To make the "seat,"

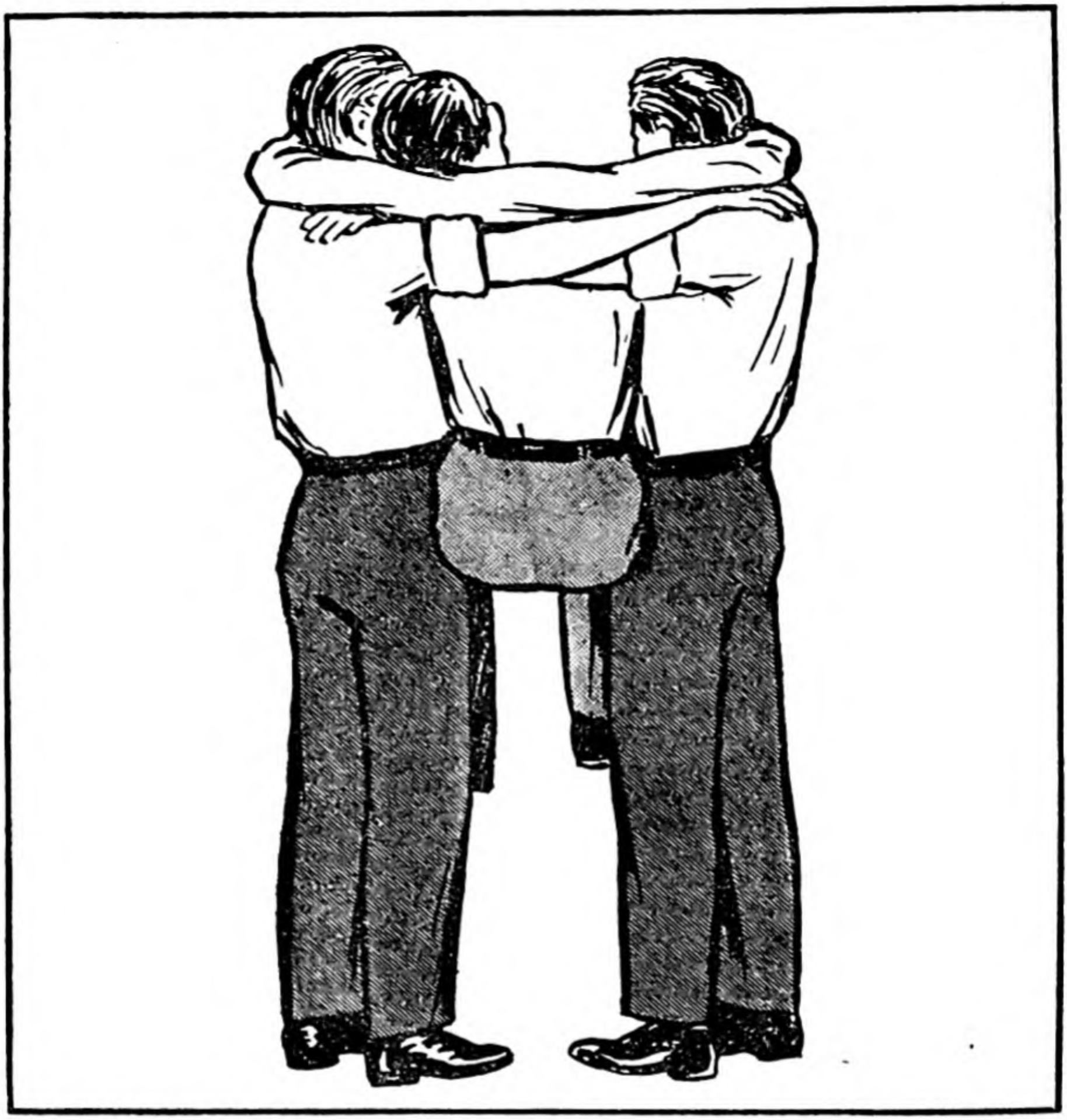


Figure 113

each bearer grasps with the hand under the thighs the wrist of the other. To make the "back rest," each bearer places his disengaged hand on the shoulder of the other (Figure 113). Unless the person is helpless, he may further support himself by placing an arm around the neck of each bearer.

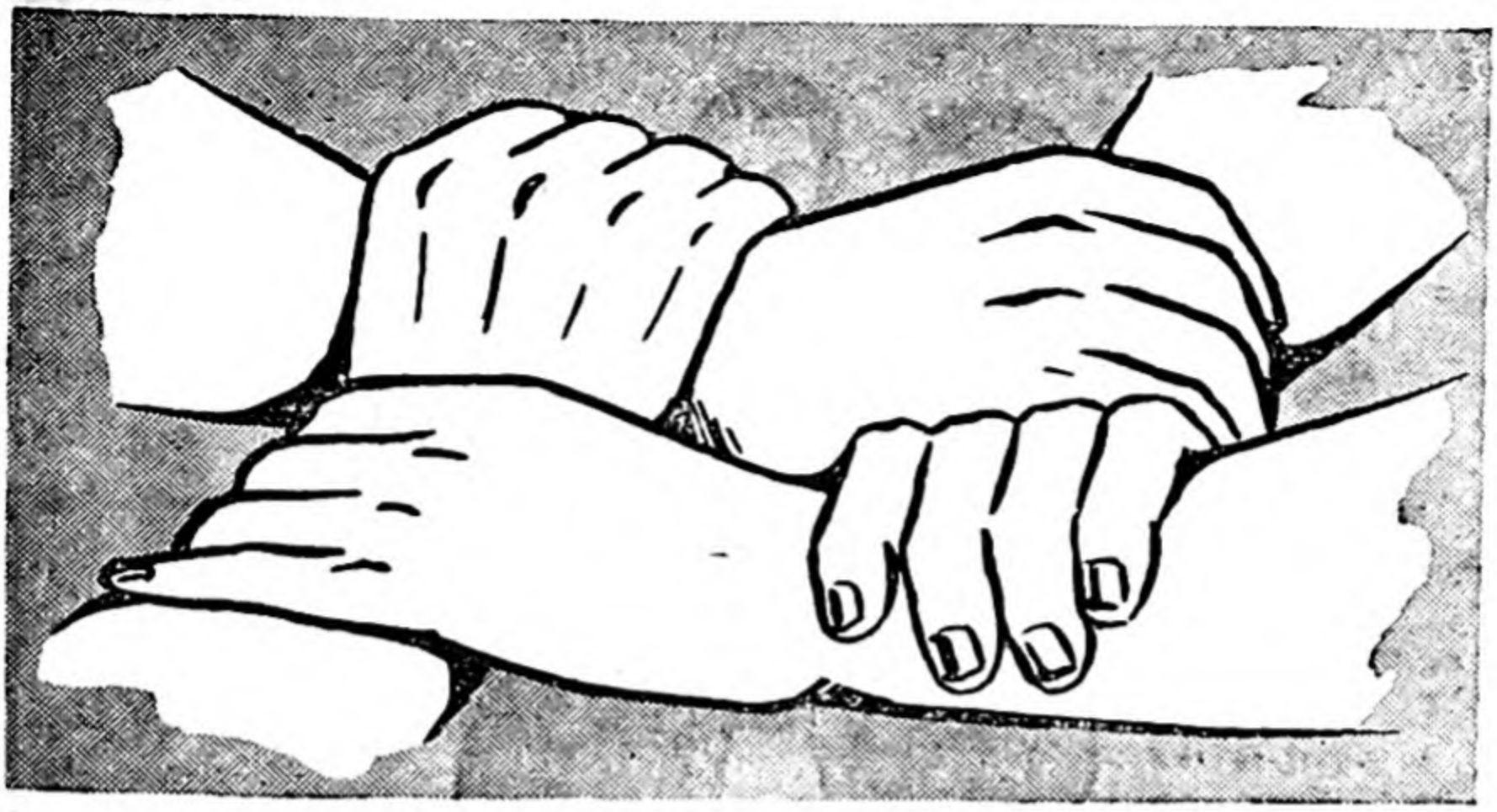


Figure 114

Four-Handed Seat Carry

This carry is what children call a "queen's chair." It can be used only to transport a conscious person.

The bearers face each other, and each one grasps his left wrist with his own right hand. To make the "seat," each bearer grasps the other's right wrist with his own free left hand (Figure 114). On this improvised seat the injured person sits and supports himself by placing an arm around the neck of each bearer (Figure 115, page 310).

TRUNK, BANDAGES FOR. *See* Bandaging, pages 121-122.

WOUNDS OF. *See under* Wounds, pages 320-321.

TURPENTINE-OIL POISONING. *See* Poison Table, page 266.

Figure 115

U

UNCONSCIOUSNESS

Next to severe bleeding, loss of consciousness appears to be the most alarming condition in an injured or sick per-

son. The unconsciousness may be complete or partial. In complete unconsciousness the victim does not respond to questioning. Shaking him or shouting at him will do no good, so do not try it. In partial unconsciousness the victim may mumble but can give no replies that make sense.

What to Do When the Cause of Unconsciousness Is Unknown. When little or nothing is known of the conditions leading up to unconsciousness, it is frequently very difficult to arrive at the true cause. In that case it is necessary to base first-aid care on the color of the face of the unconscious person and the character of his pulse as follows:

Red Face, Strong Pulse

Place the unconscious person in a lying position, raise his head slightly, and loosen the clothing about his neck. Apply cold cloths or an ice bag to his head. Cover him just enough to keep his body warm and keep him very quiet. *Give no stimulants.* If it is necessary to move the person, transport him very carefully in a lying position.

White Face, Weak Pulse

Place the unconscious person in a lying position, with his head level with or lower than his body, and keep him quiet. Cover him warmly to conserve body heat and if he seems very cold or the environment is cold apply well-covered heating agents if possible. If there is no head injury and no bleeding, an inhalation stimulant (smelling salts or a handkerchief moistened with a few drops of aromatic spirits of ammonia or with household ammonia in a dilution consisting of one part ammonia to seven parts water) may be held under the person's nose for a second or two at a time.

Blue Face, No Pulse, Breathing Stopped

Apply artificial respiration at once. While doing so, keep the person warm with blankets and external heat.

IN ALL CASES CALL THE DOCTOR.

Recognition of Cause of Unconsciousness from Preceding Occurrence

If you are familiar with the events leading up to unconsciousness, it usually is possible to determine its cause. For other signs and symptoms and first aid, see under the Cause of Unconsciousness listed.

Cause of Unconsciousness	*Preceding Occurrence or Condition*
Alcoholism	Excessive drinking of an alcoholic beverage
Apoplexy	Often vigorous exertion or strong emotion in an elderly person
Asphyxia	Choking, submersion, electric shock, inhalation of poisonous gases or vapors, hanging, or smothering
Blood, loss of	Severe bleeding
Concussion of brain	Fall or blow on the head
Diabetic coma	Known diabetes—gradual onset of a feeling of serious illness.
Epileptic fit	Convulsions in a known epileptic
Fainting	Emotional excitement (fear, joy, sorrow), sight of blood, exposure to an overheated room, and the like
Fracture of skull	Fall or blow on the head
Freezing, general	Prolonged exposure to severe cold
Heart failure	Known heart disease

Heatstroke	Exposure to intense heat indoors
Insulin reaction	Known diabetes—too much insulin or delay in eating after taking insulin
Poisoning, chemical	Poison swallowed or inhaled
Shock	Involvement in an accident when the injury sustained does not suggest unconsciousness due directly to the injury
Sunstroke	Prolonged exposure to direct rays of the sun

UTICARIA. *See* Hives.

V

VARICOSE VEINS

Varicose veins are veins which have become unnaturally enlarged and tortuous. The veins in the calf of the leg are most commonly affected. They are clearly visible as knotty bluish swellings, and unusual exertion may cause them to burst. The bleeding from a ruptured varicose vein is profuse from both ends.

What to Do. Have the victim lie down and elevate the limb. Remove any constriction, such as round garters, on the heart side of the wound. Place a compress over the wound and apply direct pressure with the fingers or press with the fingers along the edges of the wound until a compress can be obtained. Then bandage the compress snugly over the wound and, if necessary, continue pressure with the hand until a clot forms. Keep the limb very quiet when bleeding is controlled, as movement may dislodge the clot and cause the bleeding to recommence. Do not give stimulants until the bleeding has stopped. Get a physician as quickly as possible.

VENOUS BLEEDING, CONTROL OF. *See under* Bleeding, Part II, page 83.
SIGNS OF. *See under* Bleeding, Part II, page 74.
VERONAL POISONING. *See* Poison Table, Barbiturates, page 253.

V

WASP STINGS. *See under* Bites, Insect, page 125.
WHITE-LEAD POISONING. *See* Poison Table, Lead Compounds, page 259.
WHITE PHOSPHORUS (used in incendiary bombs), BURNS FROM. *See under* War Injuries, page 329.
HOW TO EXTINGUISH. *See* Appendix, page 353.
WOOD-ALCOHOL POISONING. *See* Poison Table, Alcohol, Methyl, page 251.

WOUNDS

A wound is a break in the skin or mucous membrane, with a corresponding division of the underlying tissues to a greater or lesser depth.

Classification

In general, there are four kinds of wounds:

1. *Clean-cut, or incised, wounds,* as from a cut or slash with a sharp, cutting instrument, such as a knife or razor blade, or from a piece of broken glass or sharp-edged metal. The instrument, even if it does not go very deep, cuts across hundreds of microscopic capillaries. The extent of capillary bleeding will depend upon the blood supply to the injured part. For example, a cut on the lip, lobe of the ear, or under-surface of the finger will result in far more capillary bleeding than a cut across the palm of the hand. Cut muscles, which are plentifully supplied with capillaries, will bleed profusely. The free bleeding of clean-cut wounds reduces the danger of infection.

2. *Contused, or bruised, wounds,* as from a fall or a squeeze, or from blows from some blunt object, such as a piece of falling masonry. The extent of the visible injury may give little or no indication of the damage below the skin. Bones may be fractured or vital organs split by the force of the blow. Capillaries under the skin may be broken, thus causing concealed bleeding, which is responsible for the changing colors of a contused wound.
3. *Punctured, or stab, wounds,* as from stepping on a nail, falling on a spike, receiving a scissors, knife, or bayonet thrust, or being hit by a bullet. Usually there is little bleeding and the danger of infection is great.
4. *Lacerated, or torn, wounds,* as from a crushing blow from blunt instruments, moving parts of machinery, exploding shells, large pieces of flying bomb fragments, or by falls against angular objects. The tissues are often badly mutilated. Bleeding is not necessarily excessive, owing to reduced blood pressure as a result of shock or to the sealing of the blood vessels by the crushing together of their walls. Lack of the flushing action of bleeding increases the danger of infection, especially when dirt has been ground into the wound and there has been much destruction of tissue around the edges.

In the first-aid care of wounds, the three major considerations are, in order of importance:

1. Checking severe bleeding. See Bleeding, How to Stop It.
2. Preventing or minimizing shock. See Shock, Part II, pages 95-98.
3. Preventing infection.

Wound Infection

Wound infection is caused by the entrance of germs through a break in the skin. It does not matter whether the

break is a mere pinprick, a small, broken burn blister, or a large gaping wound. The germs may be on the skin or clothing of the injured person, in dirt entering the wound, or on the wound-producing agent.

All accidental wounds contain germs in greater or lesser numbers. The disinfection of an accidental wound is accomplished by the use of antiseptics and disinfectants of various kinds (see Part I, pages 28-32). However, experience has shown that antiseptics have no chance of reaching the deeper interstices of a serious wound and tend to injure further already badly damaged tissues, thus promoting instead of preventing the risk of infection. For that reason, the first-aid care of major wounds, after bleeding has been checked, consists simply in covering the wound with a dry sterile compress to prevent further contamination. For minor wounds such as small cuts and scratches, mild tincture of iodine (2%) is considered the best disinfectant. When the iodine is dry, the wound should be covered with a sterile compress on adhesive.

Signs and Symptoms. If infection develops in a wound, the classic signs of inflammation—heat, swelling, redness, and pain—appear. In addition, pus usually, but not always, forms. The pain is throbbing in most cases. The redness surrounds the wound like a halo, and may radiate from it in streaks if the infection starts to spread. The lymph glands near an infected area attempt to block the spread of the infection by capturing and destroying the germs. Hence swollen glands are almost a sure sign of infection. Swelling occurs in the armpit, if the infection is in the arm; in the groin, if the infection is in the leg; and in the neck, if the infection is in the head.

If the infection gets loose in the blood stream, septicemia or blood poisoning is the result. A severe chill followed by fever and a feeling of acute illness are signs of the onset of blood poisoning. Sometimes these signs appear when there is little or no evidence of local infection and the patient has

forgotten the prick of the pin or thorn or the little cut through which the germs were introduced.

What to Do. At the first sign of infection, get medical aid without delay. Remember that the neglect of an infected wound, no matter how small, may result in septicemia, or blood poisoning. If it is impossible to get a physician at once, apply hot salt water as a temporary measure. Use boiled water in the container in which it was boiled, if possible. Add three tablespoonfuls of table salt or six tablespoonfuls of Epsom salts to each quart of water. The water should be as hot as the person can bear comfortably. Place the wounded part directly in the solution, if possible. If not, use large cloth compresses wrung out of the solution and change them as they begin to cool. Apply the compresses continuously for an hour and repeat every six hours until the physician arrives.

FIRST AID for Wounds of Various Types

Small Abrasions, Cuts, and Scratches. First wash your hands thoroughly in soap and water. Using sterile gauze or cotton, cleanse the surrounding skin with soap and water, saturated boric-acid solution (two scant teaspoonfuls of boric acid to one glass of water), or 70% alcohol. Wash away from the edges of the wound so as not to flush dirt or germs into it from the skin. Use a fresh piece of cotton or gauze for each application. Do not dip used gauze or cotton into the wash water or solution. If dirt is in the wound, it may be flushed out with sterile water or an antiseptic solution poured from a pitcher, or, if these facilities are not available, by holding the wounded part under a running water tap.

Next apply mild tincture of iodine (2% solution—*not stronger*) to the wound with an applicator and paint the surface around it for a distance of from one-half to one inch. Do not apply iodine a second time. Do not pour the iodine into the wound or on the compress. When the iodine is dry, cover the wound with a sterile gauze compress on

adhesive. If the wound should become infected as evidenced by redness, the formation of pus, throbbing pain, or red streaks radiating from the wound, consult a physician at once.

Major Wounds with Severe Bleeding. The first thing to do is to check the bleeding. Remove enough clothing so that the wound may be clearly seen. Then cover the wound with a sterile compress and apply pressure with your fingers or a bandage. If that does not work, press with your fingers at the correct pressure point, or, if necessary, apply a tourniquet (see Bleeding, How to Stop It, pages 132-135). Elevate the wounded part and support it in an elevated position. Keep the patient lying down and warmly covered.

When bleeding is controlled, cover the wound with a dry sterile compress and bandage it in place (see Bandaging). Take great care not to touch with your fingers the surface of the compress which is to go next to the wound. Fasten the compress firmly to keep it from slipping about over the adjacent skin, but not too tightly. The dressing once applied should not be disturbed until a physician or surgeon is able to perform the necessary thorough cleaning out, which is called debridement (from the French *débris*). However, the bandage should be examined from time to time and loosened if swelling of the area makes it too tight.

Keep the victim lying down, with blankets or coats under and over him to prevent or minimize shock which is apt to be severe. Do not give stimulants until the bleeding has been checked. Watch carefully for signs of recurrent bleeding. Bleeding is especially apt to recommence in a lacerated wound when shock begins to wear off. If blood soaks through the bandage, do not remove it, but tie another bandage over the first.

Get the victim to a physician or a physician to the victim as quickly as possible.

Some cleansing of the skin surrounding a serious wound may seem desirable when the services of a physician are not

immediately available. Do not disturb the compress covering the wound. After bleeding has been controlled, wipe the skin around the wound compress with 70% alcohol or saturated boric-acid solution. To remove grease and oil from the skin, use benzine, naphtha, oil of turpentine, kerosene, or ether. Use sterile gauze or pads of sterile cotton as swabs, a fresh one for each application, and *wash away from the wound compress, not toward it.*

Punctured Wounds. Punctured wounds are classified as perforating wounds and penetrating wounds.

In a perforating wound the wound-producing agent goes right through the body and thus the point of entrance and the point of exit are both visible. Perforating wounds are typically caused by high-velocity rifle-, revolver-, or machine-gun bullets. Small fragments from high-explosive bombs or shells and flying pieces of wood and stone also may travel at a high enough speed to cause a perforating wound. The entrance wound usually is a "punched-out" hole of small size, difficult to detect. The exit wound is usually larger, with torn edges.

Penetrating wounds do not go completely through the body. Thus, there is an entrance wound but no exit wound. Penetrating wounds are typically caused by sharp-pointed instruments, such as nails, scissors blades, pitchfork tines, knives, bayonets, and so on. Small fragments from high-explosive bombs or shells or bullets which are not traveling at a high enough speed to go completely through the body or which are stopped by bone also may cause wounds of this kind.

Owing to the elasticity of the skin, which tends to spring together (retract) when punctured, the entrance wound in either a perforated or penetrating wound may be hardly visible, and there may be little or no bleeding. The damage caused is mostly below the surface and is often of a serious nature.

What to Do. Punctured wounds are very difficult to clean

out. Antiseptics have no chance of reaching the deeper interstices of the wound where bits of dirt or clothing may have been carried along a very uneven trail. Also, air cannot get into the wound. Thus, aside from the damage which may be done to vital organs, the danger of infection, especially with tetanus bacilli, is always present (see Tetanus) in all punctured wounds.

In punctured wounds of the extremities, the wound or wounds (entrance and exit) should be encouraged to bleed and then be covered with a sterile compress. The injured person should be taken to a physician as quickly as possible for treatment with tetanus antitoxin, if the physician thinks it advisable.

In punctured wounds of the chest and abdomen, watch for signs of internal bleeding and keep the victim quiet and warm until a physician or ambulance arrives. If he must be moved, use the greatest care. Do not give stimulants or other fluids. Do not apply an antiseptic.

TRUNK WOUNDS: *Abdominal Wounds*. Wounds of the abdomen are very serious because all the vital organs with the exception of the brain, heart, and lungs are packed in it in layers. If a sharp instrument such as a knife, bayonet, or the horn of an animal, or a missile such as a bullet, shrapnel, or a bomb fragment, enters the abdomen, it may go through several organs. The entry wound may be a vertical or crosswise cut or a puncture, in some cases so minute as to be nearly invisible. Perforation of the intestinal coils, especially of the lower bowel, is particularly dangerous because of the infectious nature of the intestinal contents.

Signs and Symptoms. Signs of internal bleeding—restlessness, anxiety, and thirst with fainting, pallor, and a weak, rapid pulse—are nearly always present. Shock is usually severe.

What to Do. Place the injured person on his back and keep him warm. Do not give him stimulants or any other drink, even if he begs for it. *Anything to swallow is danger-*

ous, as the fluid or food may escape into the abdominal cavity through a wound in the stomach or intestines. If the wound gaps open with the intestine or other organs protruding, do not attempt to replace the protruded organs. Cover with a large pad of sterile gauze wrung out of a solution of warm water (preferably sterile) and salt (one teaspoonful of salt to each pint of water). Keep the compress damp, as drying out of the abdominal organs is likely to be fatal. Hold the gauze compress in place with an open triangular bandage (see page 122), or wide strips of cloth loosely secured. Get medical aid or transport the victim in a lying position to a hospital as rapidly as possible. If the wound is horizontal, bend the victim's knees over a firm pillow, or a rolled-up coat or blanket after placing him on his back on a stretcher. This position relaxes the abdominal walls.

Chest Wounds. Penetration of the heart or lungs is the chief danger in injuries of the chest. The injury may be caused by the end of a broken rib, a sharp instrument, or a missile traveling at high speed, or by crushing. Signs and symptoms and the first-aid care of chest injuries in which the lungs have been wounded are described in Part II, under Internal Bleeding, page 84, and Fracture of the Ribs, under Fractures, page 212. For bandaging of chest wounds, see Bandaging, page 121.

WRIST, BANDAGE FOR. *See* Bandaging, page 108.
BLEEDING FROM. *See* Bleeding, How to Stop It, page 134.
FRACTURE OF. *See under* Fractures, page 191.
SPRAIN OF. *See* Sprains, page 269.

Y

YELLOW-JACKET STINGS. *See under* Bites, Insect, page 125.

Z.

ZINC POISONING. *See under* Food Poisoning, page 183.

PART IV

War Injuries

WITH FEW EXCEPTIONS there is no essential difference between first aid for those injured in war and those injured in peacetime. A wound is a wound whether it be caused by fragments from an exploding bomb or by the forcible impact of metal, wood, or glass in an automobile accident. A burn is a burn whether it be caused by a fire started by incendiary bombs or by a fire started by a match. About the only injuries resulting from enemy action which are not ordinarily seen in times of peace are war-gas injuries, multiple bomb-blast injuries, and crush injuries due to being buried under debris for several hours.

Except for the materials and equipment which should be kept on hand for giving first aid in case of an enemy gas attack (see page 332) and for fighting incendiary bombs (see page 351), the first-aid supplies listed in Part I (pages 20-40) will be adequate for the temporary care of persons hurt by enemy action.

The principal implements of warfare to which civilians have been or may be exposed in the present World War include high-explosive bombs, incendiary bombs, war gases, and screening smokes.

INJURIES FROM HIGH-EXPLOSIVE BOMBS

INDIVIDUALS in the neighborhood of a bomb explosion may be (1) wounded by fragments from the exploding bomb itself or by flying objects—stones, bricks, pieces of glass, and the like; (2) crushed by the collapse of buildings; or (3) injured by the violent air movements set up by the explosion. In addition, there is danger from the fall of shell fragments from antiaircraft fire and other defense measures.

Wounds

Multiple Wounds. Experience in the present war has indicated that multiplicity characterizes the wounds inflicted by air bombardment. Many and indeed most of the parts of the body may literally be bespattered with wounds of varying severity. Shock is almost always profound.

Perforating and Penetrating Wounds. Small bomb fragments travel at high speed with a twisting motion and may cause perforating or penetrating wounds which are especially dangerous in the region of the abdomen or chest. Such wounds may be multiple, and bones in the track of the bomb fragments are usually splintered.

The important thing to remember about perforating and penetrating wounds is that external signs of injury are seldom obvious. A small tear in the clothing or a small hole or scratch in the skin with blackened edges may be the only visible evidence. Also, it is impossible to estimate the damage done, since the track of the missile cannot immediately be determined. A bomb fragment entering the thigh, for example, may end up in the abdomen, but there is no superficial way of telling this.

Lacerated Wounds. Large bomb fragments are likely to cause severe lacerated wounds similar to those produced by moving machinery. Shock is practically aways present.

First Aid

Keep the victim lying down, warm, and quiet to prevent or minimize shock. Place coats or blankets under and over him.

Exceptions: (1) If the victim of a chest wound finds it difficult to breathe, he may be propped up slightly. (2) A person with a head wound may have his head raised. (3) A person with a wound of the jaw or throat should sit up during evacuation, if possible. If he must lie down, he should be placed on his face to prevent obstruction of the air passages.

Stop severe bleeding from external wounds (see Bleeding, How to Stop It, pages 132-135). When it is controlled, apply a sterile compress (or in an emergency the cleanest cloth pad available) and fasten it in place with a bandage or adhesive tape. Do not use antiseptics.

In case of lacerated wounds without much bleeding, put a tourniquet in place but do not tighten it. Delayed bleeding is apt to occur in lacerated wounds after the initial shock has worn off (see page 82).

If it is necessary to apply a tourniquet to control bleeding, be sure to mark TK and the time of application on the victim's forehead. Use lipstick, iodine, soft pencil, crayon, or the like to do this.

If there is a chance that a casualty may become "lost in the shuffle" and not receive medical attention for some time, it is considered best to apply the tourniquet around a pad over the wound or at its immediate upper edge.

Do not try to put iodine into wounds of small caliber, since iodine is apt to do serious injury to underlying tissues.

When the stretcher-bearers arrive, call their attention to

all injuries you have noted or suspected and all first-aid measures you have taken, so that all helpful details can be written on the identification card affixed to the victim before he is sent to a hospital. A knowledge of the injuries you have discovered or suspect will also help the stretcher-bearers or ambulance attendants to handle the victim properly during transportation.

Crush Injuries

Crush injuries caused by falling walls, chimneys, and other structures are usually associated with fracture, including fracture of the skull, spine, ribs, or pelvis, and with severe mangling and compound fractures of limbs. This is true particularly of people trapped in buildings which have collapsed. There is also the possibility of asphyxiation from confinement in an enclosed space filled with escaping gas or smoke, and of burns from escaping steam.

It is to be accepted as a matter of course that persons who have been pinned under masonry or timber in damaged buildings or buried under debris must be extricated and removed with extreme care, based on the possibility of severe crush injury even though external evidence of injury is lacking. Contusions of the chest or abdomen without visible breaks in the skin may mean the rupture of internal organs. Fracture of the spine must be presumed when there is evidence of severe violence to the back, even though sensation and the power to move the limbs are present. Lacerated or crushed limbs, head, chest, or pelvis should be treated as if bones had been fractured, without stopping to hunt for signs on which to base a diagnosis. Bleeding must be checked and the victim properly immobilized and supported *before he is moved*. No attempt should be made to determine the presence or number of injuries. In the heat of the moment it is practically impossible for a layman to do this. The victim should be immobilized on a board or

splint reaching from head to heels, with his legs strapped or tied together and his arms strapped or tied to his side.

Blast Injuries

When a high-explosive bomb detonates, percussion waves are thrust violently outward into the air from the center of the blast and as violently sucked inward toward the center. The rapid alternation of blast and suction produces tremendous and serious damage within its zones of action. In the zone immediately surrounding the center of the explosion, the destruction of buildings and persons is more or less complete. In the middle zone, the violent air movements cause blast injuries many of which may be immeditely fatal. Rupture of internal organs, particularly of the lungs, poisoning by the carbon monoxide formed by the incomplete combustion of the explosive, and concussion of the brain are among the casualties produced. There may be little or no external signs of violence. In the third or outer zone, the majority of injuries are from bomb splinters or debris from houses.

If a person is not immediately killed after exposure to air concussion due to a bomb blast, absolute rest and the administration of oxygen may give him a chance of recovery. First aid consists in keeping the victim warm and quiet and getting him to a hospital as quickly as possible.

INJURIES FROM INCENDIARY BOMBS

INCENDIARY BOMBS are used in warfare to create and maintain combustion, or burning, until the object of the attack is set on fire. They also serve as flares to mark ground targets for other types of bombing. Incendiary bombs, high-explosive bombs, and gas bombs may all be dropped simultaneously over a specific area in order to cause greater destruction and to hamper the work of rescue squads and fire fighters. The equipment and methods used in extinguishing incendiary bombs are described in the Appendix, pages 350-354.

First Aid for Burns Caused by Incendiaries

First-Aid Supplies to Have Ready

Sodium bicarbonate (baking soda)

To make a solution for wetting burn compresses, mix two teaspoonfuls of baking soda with a pint of warm water.

Copper sulphate (blue vitriol)

To make a 5% solution for dealing with white-phosphorus burns, mix one and one-half tablespoonfuls of copper sulphate with one pint of warm water.

Large sterile gauze compresses or freshly laundered cloth

Triangular bandages

Tannic-acid jelly or tannic-acid solution as a first-aid dressing for burns caused by incendiaries has been discarded in England because the burned surface is usually contaminated with dirt which is sealed in by the tanning process.

The chief injuries caused by incendiary bombs are burns, either from fire or from the action of the materials released when the bomb explodes. Scalds from burst hot-water or steam pipes in buildings damaged by high-explosive bombs or incendiary bombs must also be reckoned with.

In handling victims of burns, the immediate considerations are to reduce pain and prevent the development of shock. If a doctor is immediately available or the victim can at once be taken to a hospital, the only first-aid measures required are *first* to exclude air from the burned area by covering it with a sterile dressing wet with a solution of baking soda, and *second* to wrap the victim in a blanket in order to keep him warm. *Do not use greasy or oily ointments of any kind.*

If delay in securing medical treatment is unavoidable, the first-aid measures recommended may be summarized as follows:

1. Carefully remove clothing from the burned area except where it sticks.
2. Keep blisters intact if possible.
3. Cover the burned area with strips of sterile cloth soaked in a solution of baking soda.
4. Bandage the dressing lightly in place and wrap the victim in blankets. Give sweet, warm drinks.
5. Get a doctor or transport the victim to a hospital as quickly as possible.

Burns Caused by Droplets of Molten Metal or Hot Oil. Burns from molten metal, such as thermit, released in the explosion of incendiary bombs make up in depth and severity what they lack in extent.

First aid consists in cooling the metal by flushing the areas of penetration with large quantities of water. Pellets of metal buried in the burned area must be removed by a physician.

Flaming oil in clothing or on the skin must be smothered

and the resulting burns cared for as for burns from other causes.

Burns from White Phosphorus Released in the Explosion of Incendiary Phosphorus Bombs and Smoke Shells. White phosphorus is self-igniting when dry and exposed to air. White-hot particles adhering to the skin or buried in the flesh under the skin continue to burn until extinguished. The immediate first-aid measure to take is to exclude air from the affected area by immersing it in hot water (40° C. or 104° F.). Besides extinguishing the fuming particles by cutting off air, hot water melts the phosphorus, which may then be squeezed out or wiped out with a gauze pad. It is necessary to keep the area wet until the phosphorus particles are extracted, because they will burst into flame again if they are allowed to become dry. If cold water is used, the particles will not melt and must be picked out with forceps while the affected part is under water.

Another method is to apply cloths wet with a 5% solution of copper sulphate (blue vitriol) to the burned area. Copper-sulphate solution forms a coating of copper salts over the phosphorus particles, thus shutting out the air and stopping the burning. The copper-coated phosphorus may then be removed by forceps or irrigation with water. After removal by either method, the resulting burns should be cared for like any other burn. Do not use tannic-acid jelly or tannic-acid solution, because tannic acid ignites in the presence of phosphorus.

INJURIES CAUSED BY WAR GASES AND SCREENING SMOKES

ALL IRRITANT and poisonous chemicals used in military operations for offense or defense, or for terrorizing and immobilizing the civilian population, are called "war gases."

Probably there is no weapon more likely to cause panic than "gas." But experience has shown that panic can be avoided when civilians are supplied with gas-protective equipment and trained in its use. The surprise value to the enemy of a gas attack is lost when the fear of gas has been dispelled by a knowledge of how to combat it.

Gas can and probably will be used at any time that it will give military advantage to the enemy. Gas masks and gas-protective clothing will be distributed to the civilian population and training in their use demonstrated if there is the slightest reason to believe that the enemy will resort to chemical warfare. Measures will also be taken to set up the organization and provide the equipment for the protection of groups of persons. Such measures include the provision of a gas-alarm system, gasproof shelters, and decontamination equipment and personnel trained in its use.

Classification of War Gases

The chemical agents used in warfare for their poisonous or irritant effect on the body are called gases because they can be spread through the air at and around the target. They may be classified as follows:

1. *True Gases.* The true gas most commonly employed in chemical war is a colorless heavier-than-air gas called phosgene or choky gas. Another is the yellow-green gas, chlorine.

True gases, like phosgene and chlorine, which mix with air and are quickly diluted and carried away by the wind and air currents are called *nonpersistent gases.* Hence their menace is short-lived, especially if there are winds or rising air currents to disperse them.

True gases chiefly affect the lungs and hence are classed as lung irritants.

2. *Liquids.* Mustard gas or "hot stuff" (a heavy, dark, oily liquid), and lewisite or "mustard imitator" (a dark-green, oily liquid), are the best-known examples of war gases that are liquids in their normal state. When released from their containers, they form a cloud of poisonous gas which slowly evaporates.

Chemical agents which are normally liquids, like mustard gas and lewisite, evaporate slowly after their release and will persist in an area for days or even weeks, thus making the area uninhabitable unless decontamination procedures are carried out. Such chemicals are called *persistent gases.* They chiefly affect the skin and for that reason are classed as vesicants, that is, skin-blistering gases.

3. *Solids.* Solid chemical agents, such as the brown crystalline powder known as tear gas (chloracetophenone) and the yellow-green, granular solid, adamsite, when burned or exploded spread in the form of a cloud of small, solid particles or as smoke.

Smokes of this kind, which chiefly affect the eyes, are called lacrimators (tear gases). Those which chiefly irritate the nose and throat are called sternutators (sneeze gases).

In addition to lung irritants, vesicants, sternutators, and

lacrimators, it is possible that certain gases which poison the nervous system or interfere with the oxygen-carrying capacity of the blood may be used by the enemy. These gases are classified as systemic poisons. Among them are hydrocyanic gas, carbon monoxide, and arsine.

Protection Against Poisoning

The immediate protective measure against a war gas is holding the breath until a gas mask can be put on and adjusted. It is important to practice putting on the mask and adjusting it according to directions. Prompt retreat from the gassed area is the next step to take. Gases tend to travel downwind, so move upwind if you are outdoors. If gas has been released upwind from you, move across the wind until you are out of the stream.

War gases are usually heavier than air and tend to settle in hollows. For that reason avoid low places and basements. The second story of a building is practically safe. Close all doors and windows and stuff cracks and chimneys. If doors and windows are broken by the force of an explosion, cover the openings with wet blankets fastened tight at the edges.

When enemy invasion is threatened, gasproof shelters are usually provided for the protection of groups of people. It is not necessary to wear masks in the shelter. If the gas attack is prolonged or persistent gases are used, such shelters are needed for eating, sleeping, rest, and medical-aid stations.

First-Aid Supplies for War Gas Injuries

Label the Containers and Note the Gases and Their Characteristic Odors for Which Each Substance Is Used in Giving First Aid

Sodium Bicarbonate (baking soda)

Two teaspoonfuls in a pint of warm water (2% solution).

For irrigating eyes following exposure to blister gases, tear gases, or other chemical agents.

For washing nose, throat, and stomach following exposure to blister gases.

For drinking after swallowing food or drink contaminated with blister gas.

Kerosene

For removing liquid mustard from the skin.

Bleaching Powder (chloride of lime, 30% chlorine) in ointment or paste form

For decontaminating the skin after exposure to blister gases.

To make bleach ointment, mix equal parts by weight of bleaching powder and white petroleum jelly. This paste will keep well in a closed jar. To make aqueous bleach paste, mix bleaching powder and water to a creamy consistency—roughly one part of powder to one or two parts of water by volume. This paste will remain effective for several weeks if stored in an enameled jar with a tight-fitting lid. A large, empty cold-cream jar will do.

Bleaching-Powder Sniff Bottle

For inhalation of chlorine after exposure to irritant smokes.

To make a bleaching-powder sniff bottle, place a small amount of bleaching powder in a wide-mouthed bottle with a tight-fitting stopper.

Soap

For washing the skin after using decontamination agents in blister-gas cases.

Hydrogen Peroxide

For removing lewisite from the skin.

Hydrogen peroxide may be purchased as a solution in water in concentrations of from 2 to 30%. The solution usually found in drugstores is the U.S.P. strength of 2.5 to 3.5% hydrogen peroxide. Since solutions of hydrogen peroxide gradually deteriorate, an old "stale" solution may not be effective.

For irrigating the eyes after exposure to lewisite.
Use a 0.5% solution of hydrogen peroxide, which can be made by diluting one part of a 2% solution with three parts of water, or one part of a 3% solution with five parts of water.

Alcohol, 70%

Boric-Acid Crystals
Two scant teaspoonfuls in a pint of warm water (2% solution) as an eyewash after exposure to irritant smokes.
Two teaspoonfuls in a glass of warm water (saturated solution) as a nose spray after exposure to irritant smokes.

Aspirin, five-grain tablets
To relieve headache after exposure to irritant smokes.

Copper Sulphate (blue vitriol)
One and one-half tablespoonfuls in a pint of water (5% solution) for white-phosphorus burns.

Absorbent Cotton

Enema Can and Tube for irrigating eyes

Identification and First Aid

LUNG IRRITANTS

Chlorine. *Odor,* highly pungent.
Chloropicrin. *Odor,* flypaper, anise.
Phosgene. *Odor,* musty hay, green corn.

Effects. Essentially the same kind of damage is caused by all lung irritants. The outstanding effect is pulmonary edema, that is, a water-logged condition of the lungs. Irritation of the delicate lung membrane encourages the seepage of tissue fluid into the air sacs.

The acute changes caused by phosgene are practically limited to the lungs. Chlorine and chloropicrin are less toxic than phosgene but more irritating to the eyes and upper respiratory tract.

Latent Period. The rate of onset and the degree of the

edema of the lungs depend upon the particular gas and on its concentration and the length of exposure. There is usually a latent period lasting from one to twelve or more hours between exposure and the development of symptoms. This latent period always occurs after exposure to phosgene and may last for more than twelve hours. The latent period for chloropicrin is usually short and may be less than one hour. For chlorine there may be no latent period.

Complete rest and warmth are extremely important for victims of lung-irritant gases during the latent period when they feel perfectly well. They must not be allowed to sit up or even to feed themselves, as any activity may result in sudden collapse and death.

Signs and Symptoms. Early signs (which may not develop for from twelve to twenty-four hours after exposure, especially in the case of phosgene poisoning) include violent coughing, tightness and pain in chest, eye irritation, and vomiting. As edema of the lungs develops, the victim may suddenly pass into extreme cyanosis (the blue type of asphyxia) and then into a state of shock (the gray or pallid stage of collapse), and die within a few hours.

First Aid. Remove the victim from the gassed area promptly. Keep him very quiet and warm on a stretcher or bed. Give him hot, stimulating drinks such as coffee or tea. By keeping the victim lying down, even when he feels perfectly well, his oxygen requirements are reduced. Warmth not only helps to combat shock, but also lessens any tendency to the muscular movements of shivering. Watch the victim carefully, remembering the possibility of sudden death and of the aggravation of pulmonary edema after it has begun to subside.

Get a doctor as soon as you can, so that first-aid medical treatment consisting of liberal oxygen inhalation can be started as quickly as possible after the appearance of symptoms. If oxygen is supplied, the victim's chance of recovery is greatly increased. Further treatment should be carried on

in a hospital, where other measures found to be effective can be administered.

Do not give artificial respiration to relieve difficult breathing when the blue or gray stage indicates that pulmonary edema has developed. Remember that the air cells of the lungs are filled with fluid and any manipulation may be fatal.

For irritation of the eyes, nose, and throat, irrigate with a solution of sodium bicarbonate.

SKIN-BLISTERING GASES

Ethyldichlorarsine. *Odor,* biting or stinging like pepper in the nose.

Lewisite. *Odor,* geraniums.

Mustard gas. *Odor,* garlic, horse-radish, mustard.

The persistency and insidiousness of skin-blistering gases cause many casualties, but the death rate is low. These gases, especially mustard, may be present in the air in concentrations high enough to produce burns and yet not high enough to produce the characteristic odors by which they are detected.

Effects. Vesicant gases burn and blister any tissue with which they come in contact. Thus their action is not limited to a special body structure as with lung irritants or tear gases, for example. If inhaled, vesicant gases burn the nose, throat, and lungs; if taken into the stomach with contaminated food or drink, they burn the stomach lining.

Vesicant gases are classified according to whether they are simple skin-blistering agents, like mustard gas, or skin-blistering agents containing arsenic, like lewisite.

Latent Period. The victim may be contaminated by the gas and yet not begin to suffer its effects for some time. Liquid gas coming in touch with the skin sinks in as ink sinks into blotting paper, and persists in the tissues unchanged for many hours. One drop the size of a pinhead can eventually produce a blister the size of a quarter. The skin

effects following exposure to the vapor may be delayed for two or three hours and often longer.

Mustard Gas

Signs and Symptoms. If unprotected by a gas mask, the eyes usually show the effects first. They begin to smart and water within two to three hours after exposure to the vapor and then become red and swollen. If liquid mustard is splashed directly into the eyes, the effects are more severe and develop more rapidly; ulcers of the cornea of the eye may follow the initial eye inflammation.

Skin burns from the vapor may be delayed for twelve hours or longer; from the liquid, for one hour or longer. The first skin symptom is usually itching followed by a burning sensation and redness resembling sunburn. Just before the blisters appear in the reddened area, the skin may easily be rubbed raw. The burns are more severe in moist, sweating areas of the body such as the armpits and folds of the neck, elbow, and knee. Vapor burns are more severe on areas of the body covered with clothing, since clothing interferes with the dissipation of the mustard.

Inhalation of the vapor causes severe inflammation of the nose, throat, larynx, windpipe, bronchial tubes, and lungs. The first signs of respiratory-tract irritation are hoarseness and coughing. Bronchitis followed by bronchopneumonia occurs in a high percentage of cases.

Nausea and vomiting, associated with pain, occur and may be persistent. If contaminated food or liquid is swallowed, extreme nausea, vomiting, diarrhea, and collapse result.

First Aid. Immediate steps to prevent burning must be taken. A delay of a minute or two in the case of liquid contamination with mustard gas and of from ten to fifteen minutes following exposure to the vapor is apt to have serious results.

1. The first step is to remove contaminated clothing and shoes. The person assisting with this operation must be protected with a mask, gasproof gloves, apron, and protective ointment. After removal, the clothing must be placed in a covered metal container until decontaminated. The decontamination of clothing may be accomplished by long exposure to windy air, by boiling, by chlorination, or by the action of bleaching powder. In areas subject to gas attack, special gas-cleansing centers are provided for the decontamination of individuals and clothing, and decontamination squads are trained in the methods required to decontaminate soil, streets, walls and floors, metal equipment, and the like.
2. After removing contaminated clothing, the victim or the person helping him should attempt to remove mustard from the skin by one of the following methods:

Method I. First dab the affected areas with dry absorbent pads to remove any mustard remaining on the surface. Then gently and repeatedly dab the skin with a pad dampened with kerosene, gasoline (nonleaded), or alcohol. Protect the hands with oilskin or rubber gloves. Moisten only part of the pad, and hold the dry portion between finger and thumb. Take great care to confine removal operations to the contaminated area. The solvents mentioned do not destroy the gas, but merely dissolve it, and if allowed to run over the skin serve to spread the poison. Repeat the dabbing, using a fresh pad for each application, as long as the characteristic odor of the gas persists. Thorough washing of the contaminated area with soap and water within and around the margins completes the treatment. Pat the area dry with a towel. Do not rub, as the skin can be rubbed raw with even slight pressure and friction.

Method II. If kerosene, gasoline, or alcohol is not avail-

able, wash the contaminated area with soap and water, using hard soap and frequent changes of water. This treatment merely removes the mustard in the lather; it does not destroy it. The washing therefore should be confined to the contaminated area, and if possible protective gloves should be worn. If this treatment is not delayed beyond five minutes, blistering of the skin is usually prevented, although redness will probably develop.

Method III. Thoroughly rub into the contaminated skin for one minute bleach ointment or aqueous bleach paste (see page 333) and then wipe it off immediately. Bleaching powder, which is ordinary chloride of lime, contains chlorine. The chlorine, which is released when the bleaching powder is exposed to air, reacts with the gas to destroy it. Bleach ointment or paste must be wiped off within two or three minutes after use, as bleaching powder is in itself irritating and may increase the burn. The skin should then be washed, care being taken to keep the bleach from entering the eyes. If it does get into the eyes, it is removed by irrigating the eyes with cold water.

3. If mustard vapor has affected the eyes, irrigate the eyes with 2% sodium-bicarbonate solution or plain water. This is best done by flushing water across the eyeball from the rubber tube of an enema can. *Do not bandage the eyes,* since free drainage of the discharge is essential. However, the eyes may be protected from light with a forehead shade which may be improvised from brown paper or similar material. Drops of cod-liver oil in the eyes following irrigation are recommended.
4. If mustard vapor has entered the nose and throat, flush out the nose and gargle repeatedly with sodium-bicarbonate solution.

5. If violent nausea and vomiting indicate that contaminated food or liquid has been swallowed, give large quantities of warm sodium-bicarbonate solution and induce vomiting to wash out the stomach.

After first-aid measures to remove the gas have been taken, keep the victim quiet and warm. Persons who have extensive burns of the skin, eyes, nose, and throat should be sent to the hospital as soon as possible.

Lewisite

The skin-blistering effects of lewisite are similar to those of mustard gas but develop more quickly after exposure. The blisters are filled with cloudy fluid and are not surrounded by a reddened area, whereas the blisters raised by mustard gas are filled with clear fluid and are surrounded by a reddened area. The burns produced by lewisite are more painful and dangerous than those of mustard gas. Unless neutralized or removed, lewisite continues to burn through the skin into the muscles and the body tissues.

Lewisite is an arsenical compound, and the fluid in the burn blisters contains arsenic. Extensive burns caused by it may give rise to symptoms of arsenic poisoning.

First Aid

Skin. To be completely effective, preventive treatment must be begun within one minute after contamination. Remove clothing as described under first aid for mustard gas (page 338), and at the same time begin preventive treatment. The following methods are given in order of preference:

Method I. Swab the contaminated areas repeatedly with hydrogen peroxide. Strong solutions (10 to 20%) are best, but the ordinary 2.5 to 3.5% solution available in drugstores will do.

Method II. Swab with kerosene, gasoline (nonleaded),

alcohol, or apply bleach ointment or paste as described under the preventive treatment for mustard gas (pages 338-339).

Whichever method is used, wash the skin thoroughly with soap and water and pat it dry following preventive treatment.

Eyes. Liquid lewisite splashed in the eyes may cause blindness unless it is removed quickly. Instill 0.5% hydrogen peroxide immediately and repeatedly or, if that is not available, irrigate with 2% sodium-bicarbonate solution.

Nose. Wash out the nose with 2% sodium-bicarbonate solution.

A victim of lewisite burns must be placed under a physician's care as quickly as possible, so that the blisters may be opened in order to prevent further absorption of arsenic. A thick paste of ferric hydrate in glycerine may be used in the aftercare of the burns. Ferric hydrate acts as an antidote to arsenic.

Ethyldichlorarsine

Effects. This gas is more irritating to the nose and throat and less irritating to the skin than lewisite or mustard. It may cause arsenic poisoning. The first symptoms are usually sneezing and vomiting. If not removed quickly, blisters, sores, and paralysis of the hands occur.

First Aid. The preventive treatment is the same as for lewisite. Irritation of the nose may be relieved by inhaling chlorine from a small amount of bleaching powder in a wide-mouthed bottle. Repeated drinks of warm 2% sodium-bicarbonate solution help to relieve vomiting.

STERNUTATORS

Irritant Smokes

Adamsite. *Odor,* coal smoke.
Diphenylchlorarsine. *Odor,* shoe polish.

Effects. Irritant smokes are used chiefly for their harassing effect and to interfere with the appliance of a gas mask when used in combination with lung irritants. Their effects are confined almost entirely to the eyes, nose, and throat. Although they produce no organic damage, they have a depressing effect, and severely gassed persons may try to commit suicide.

Signs and Symptoms. Small quantities of irritant smoke in the air cause burning pain in the eyes, nose, and throat, repeated violent sneezing, and a flow of tears. Severe headache, tightness or pain in the chest, nausea, and sometimes vomiting may occur. Mental depression is common.

First Aid. Get the victim into pure air as quickly as possible. Keep him warm and quiet, and let him sniff chlorine from a wide-mouthed bottle containing a small amount of bleaching powder. Irrigating the eyes with a warm 2% boric-acid or sodium-bicarbonate solution and spraying the nose with saturated boric-acid solution will also give relief. For headache give from ten to fifteen grains of aspirin. Reassure the victim by telling him, truly, that his condition is not serious and that he will feel better shortly. Usually the symptoms pass away in from thirty minutes to two hours.

LACRIMATORS

Tear Gases

Chloracetophenone. *Odor,* apple blossoms.
Brombenzylcyanide. *Odor,* sour fruit.

Effects. Tear gases have an action similar to irritant smokes but have a more severe effect upon the eyes. If the liquid itself gets into the eyes, permanent damage may be done.

Signs and Symptoms. The eyes begin to smart immediately. The lids shut tightly and cannot be opened. There is

a copious flow of tears. Chloracetophenone may cause a mild skin irritation in warm weather.

First Aid. Get the victim into pure air at once and have him face the wind with his eyes open. Irrigate the eyes with a 2% sodium-bicarbonate solution. *Do not let the victim rub his eyes, and do not bandage them,* as free drainage is necessary. Complete recovery usually takes place within an hour.

SCREENING SMOKES

HC mixture, a gray solid producing gray smoke. *Odor,* sharp-acrid.

Sulphur trioxide, a clear liquid producing dense white smoke. *Odor,* burning matches.

Titanium tetrachloride, a yellowish liquid producing white smoke. *Odor,* acrid.

White phosphorus. *Odor,* burning matches.

Effects. Screening smokes are used in warfare to conceal military operations. They are irritating and unpleasant to breathe, but not dangerous. The smoke from white phosphorus is harmless, but the white-hot particles shot out when its container explodes will cause burns if they come in contact with the skin (see page 329).

First Aid. Contamination with the liquid chemicals, sulphur trioxide and titanium tetrachloride, produces acid-like burns of the skin. Spray in the eyes may cause serious burns.

Wash the affected areas with large quantities of water and then wash the skin and irrigate the eyes with a 2% sodium-bicarbonate solution.

SYSTEMIC POISONS

Arsine. *Odor,* garlic.

Carbon monoxide. Odorless.

Hydrocyanic acid. *Odor,* bitter almonds.

Arsine

Arsine has not been used in chemical warfare, but it may be developed as a war gas because of the fact that it is heavier than air. It destroys the red blood corpuscles and is very toxic in fairly low concentrations.

Symptoms. The symptoms of poisoning, which usually appear after a few hours of exposure to the gas, are faintness, dizziness, headache, weakness, pain in the abdomen, nausea, and vomiting. Severe anemia develops when the toxic effect on the red blood cells is intense.

First Aid. Keep the victim quiet and send him to a hospital as soon as possible. Meanwhile make him drink large quantities of an alkali, such as a 2% sodium-bicarbonate solution. This makes the urine alkaline and may help to keep protein from the destroyed red blood cells from coagulating and clogging the kidneys.

Carbon Monoxide

Carbon monoxide has never been used as a war gas, but it is frequently encountered as an incident of warfare. Enormous quantities are produced by all explosives, and the rupture of gas mains during bombing attacks may flood basements, tunnels, and other enclosed places.

First Aid. Immediate removal from the contaminated atmosphere and the administration of artificial respiration, if the victim's breathing is shallow or stops, are the immediate first-aid measures to take (see pages 220-222 for symptoms and further care).

Hydrocyanic Acid

This gas was tried in the last war, but its use was soon discontinued because it was impossible to obtain lethal concentrations. Because of its deadliness its further development and use by the enemy are possible.

Effects. One sniff of a strong concentration of this gas almost immediately causes the collapse of the victim. Weaker concentrations may produce headache, giddiness, and nausea.

First Aid. A rescuer must not enter an area gassed with hydrocyanic acid to give first aid *unless he wears a gas mask*. Breaking amyl-nitrite ampules under the victim's nose so that he can inhale the fumes and giving artificial respiration are the two first-aid measures to administer until a physician arrives. Artificial respiration should be continued until the victim is pronounced dead by a physician.

WAR GAS TABLE

Gas	*Odor*	*Effect on Body*	*What to Do*	*What Not to Do*
ADAMSITE *irritant smoke*	Coal smoke	Causes sneezing, sick depressed feeling, and headache.	Remove to fresh air. Keep warm and quiet. Inhalation of dilute chlorine from bleaching-powder bottle. Aspirin for headache. Reassure.	
BROMBENZYL-CYANIDE *tear gas*	Sour fruit	Makes eyes smart and shut tightly; tears flow, head aches. Effects last for some time	Wash eyes with boric-acid solution.	Do not bandage eyes or allow victim to rub them.
CHLORINE *lung irritant*	Highly pungent	Causes severe coughing, crying, vomiting, feeling of suffocation.	Remove from gassed area; keep quiet and warm. Wash eyes with sodium-bicarbonate solution. Give coffee as stimulant. Hospital case.	Do not give artificial respiration to relieve difficult breathing. Do not allow smoking, as this may cause coughing, hence added strain on the heart.
CHLOROPICRIN *lung irritant*	Flypaper, anise			
CHLORACETOPHENONE *tear gas*	Apple blossoms	Makes eyes smart and shut tightly; tears flow. Temporary.	Wash eyes with boric-acid solution or plain water. Face the wind with eyes open.	Do not bandage eyes or allow victim to rub them.

Gas	*Odor*	*Effect on Body*	*What to Do*	*What Not to Do*
DIPHENYL-CHLORARSINE *irritant smoke*	Shoe polish	Causes sick feeling and headache.	Remove to fresh air. Keep warm and quiet. Inhalation of dilute chlorine from bleaching-powder bottle. Aspirin for headache. Reassure.	
ETHYL-DICHLOR-ARSINE *skin-blistering gas*	Biting or stinging, like pepper in nose	Sneezing and vomiting first; then blisters, sores, and paralysis of hands	Undress; remove liquid with hydrogen peroxide or kerosene; then wash with soap and hot water. Irrigate eyes and nose with sodium-bicarbonate solution. Hospital case.	Do not soak the swabs or pads used in the solvent—*dampen them only. Do not rub* while removing the poisonous liquid or while washing the area afterward—*dab or pat*. Do not use bandages.
HC MIXTURE *screening smoke*	Sharp—acrid	Irritating and unpleasant to breathe.	Nothing, as effects are harmless.	
LEWISITE *skin-blistering gas containing arsenic*	Geraniums	Severely irritates eyes and respiratory tract. Causes painful itching blisters on skin, filled with cloudy fluid and no surrounding redness. Immediate effect.	Undress; remove liquid with hydrogen peroxide or kerosene. Then wash with soap and hot water. Irrigate eyes and nose with sodium-bicarbonate solution. Hospital case.	Do not soak the swabs or pads used in the solvent—*dampen them only*. Do not rub while removing poisonous liquid and washing skin—*dab or pat*. Do not bandage eyes

Gas	*Odor*	*Effect on Body*	*What to Do*	*What Not to Do*
MUSTARD GAS *skin-blistering gas*	Garlic, horseradish, mustard	Causes itching blisters on skin, filled with clear fluid and surrounded by redness. Inflames respiratory tract. Delayed effect.	Undress, remove liquid with kerosene or with bleaching powder (chloride of lime) mixed half and half with white petroleum jelly (bleach ointment) or water (aqueous bleach paste). Then wash with soap and hot water. Irrigate eyes with sodium-bicarbonate solution or plain water Hospital case	Do not soak the swab. or pads used in the solvent—*dampen them only*. Do not rub while removing the poisonous liquid and while washing the skin afterward—*dab or pat*. Do not bandage eyes.
PHOSGENE *Lung-irritant gas*	Musty hay, green corn	Irritate lungs, causing edema; action usually delayed for from 12 to 24 hours after exposure.	Keep victim quiet and warm, even if he feels perfectly well Give coffee as stimulant. Hospital case.	Do not give artificial respiration to relieve difficult breathing. Do not allow smoking, as this causes coughing, hence added strain on the heart.
PHOSPHORUS, WHITE *screening smoke*	Burning matches	Burning particles adhere to skin or clothing, causing burns. Smoke is harmless.	Pack affected skin area in cloths wet with copper-sulfate solution or immerse in hot water. Pick or squeeze out particles. Give first aid for burns.	Do not allow the skin area or clothing affected to become dry until all particles have been removed

Gas	*Odor*	*Effect on Body*	*What to Do*	*What Not to Do*
SULPHUR TRIOXIDE *screening smoke*	Burning matches	Liquid may cause acid-like burns of the skin and serious burns of eyes.	Wash the affected areas with water and then wash skin and irrigate eyes with sodium-bicarbonate solution.	
TITANIUM TETRA-CHLORIDE *screening smoke*	Acrid			

Appendix

HOW TO DEAL WITH INCENDIARY BOMBS

THE INCENDIARY BOMBS commonly used in warfare are classified as follows:

1. *Magnesuim bombs,* ranging in size from about two to fifty-five pounds, consist of a cylinder of magnesium (an inflammable metal) filled with thermit (a mixture of finely divided aluminum and iron oxide). Upon impact, an ignition device inside the bomb ignites the thermit mixture which in turn ignites the magnesium casing. A bomb weighing two and one-half pounds will burn with intense heat for from fifteen to twenty minutes.
2. *Thermit bombs,* weighing from ten to one hundred and thirty-two pounds, consist of a noninflammable case filled with thermit. They may be fired with an ignition device on impact or with a time fuse set to ignite the thermit at a predetermined time. Delayed-ignition bombs are usually of a penetrating type so that they can penetrate roofs and then set fire to the interior of buildings.
3. *White-phosphorus bombs* of almost any size are composed of a thin steel container filled with white phosphorus and a burster charge to explode the container. The white-phosphorus particles released in showers ignite instantly upon contact with the air. As an incendiary agent, white phosphorus is not especially dangerous, but the fuming particles falling on the skin of human beings cause severe burns.

4. *Oil bombs* consist of large drums filled with fuel oil or solidified gasoline with a burster charge to explode the drum upon impact and ignite the oil or gasoline.

Fighting the fires caused by incendiary bombs does not differ from fighting fires caused by less spectacular means. Dealing with the bomb itself requires special techniques.

Equipment for Fighting Incendiary Bombs

The part to be played by the householder in an area subject to attack from aerial incendiaries is to make the necessary preparations and know how to use the equipment provided beforehand. To make room for fighting fires and to reduce the chance of their spread, all furniture and junk of all kind should be removed from the attic or top floor of the dwelling. A layer of sand, finely sifted earth, or other fire-resistant material should be spread over the floor. The equipment recommended for fighting incendiary bombs is as follows:

1. Buckets capable of holding at least ten gallons of water to be filled and set at various strategic places in the house or apartment when needed.
2. A water pump can or tank, or a water container, such as a bucket, with a stirrup pump and twenty feet or more of hose.
3. If the water supply provides enough pressure, garden hose that can be attached at one end to a faucet.
4. Two fireproof buckets of dry sand.
5. A coal scuttle, galvanized-iron bucket, or other fireproof receptacle with a layer of sand in the bottom for removing blazing bombs.
6. A long-handled, lightweight shovel.
7. Heavy leather gloves to protect the hands.
8. Heavy goggles to protect the eyes.

All equipment should be placed where it can be picked up quickly and carried "on the run" to the scene of the fire.

Two persons, preferably three, are needed to deal with an incendiary bomb, although one person at a pinch may fight it successfully if he goes into action quickly enough.

Methods of Dealing with Magnesium Bombs

The heat from magnesium bombs is so intense that it is impossible to approach them closely. The fire fighter must protect himself—both from the heat and from the flaming molten metal thrown about—with a screen such as a large chair or an overturned table. He should wear goggles to protect his eyes or improvise means of shading them.

The first thing to be decided instantly is whether to fight the bomb or put out the fires it has already caused. If flimsy materials such as curtains have caught fire or the fire has gained considerable headway, this emergency must be dealt with first. If not, the bomb should be tackled first.

The Use of Water. Water will cause a magnesium bomb to burn out much more quickly than it ordinarily would, since magnesium in burning takes oxygen as readily from water as from air. Civilian-defense authorities now recommend that burning magnesium bombs be attacked with a strong stream of water from a hose rather than with a fine spray of water earlier recommended. A solid stream is considered to be better than a spray because it puts out the bomb in a few seconds instead of several minutes and the fire fighter can play water on the bomb from a safer distance—some twenty feet or more. If the bomb explodes, the stream from the hose will force the molten fragments away from the fire fighter. In using a stirrup pump attached to a container of water, one person is needed to work the pump while a second person, standing at least twenty feet away from the burning bomb, directs a stream of water on it from the hose. Water in a solid stream or from buckets

should be used to put out the fires set by the bomb and to cool the surrounding area so that the fire cannot spread.

The Use of Sand. Incendiary bombs may also be smothered with dry sand. After enough sand has been thrown on the bomb from a distance to lower the degree of heat to a point where it can be approached, it may be scooped up on the shovel and (1) thrown out of a window where it can burn out without doing harm, or (2) put into a coal scuttle or bucket on top of a layer of sand and carried out of the house by looping the handle of the scuttle or bucket on the shovel handle, or (3) dumped into a bucket of water or a bathtub filled with water. If the last method is used, it is very important to have enough water in the container to cover the bomb completely.

The Use of Fire Extinguishers. War or no war, every home should be equipped with a fire extinguisher. Whatever its type, it can be used to put out fires caused by bombs. However, not all extinguishers are safe to use in dealing with the bomb itself.

If the label on your extinguisher indicates that its contents include *carbon tetrachloride,* it cannot be used on a magnesium bomb. It will not work, and it may cause the development of a dangerous gas. It can be used to put out fires caused by the bomb after the bomb itself has burned out or has been removed.

If your extinguisher is of the *soda-acid* or *foam type,* it can be used on the bomb itself, but one extinguisher alone will not put out a bomb. For that reason it is best to have sand or water pump-can equipment on hand to attack the bomb and to save the extinguisher for attacking the fires it causes.

Dealing with Thermit and White-Phosphorus Bombs

It is useless to try to put out a thermit bomb. Usually these bombs are very large—thirty-three-pound and one-hundred-and-thirty-two-pound—and burn so furiously that

they are expended in a very few moments. The mass of spurting fire and molten iron released sets serious fires in a very few minutes. About the only thing to do is to report the fire to your air-raid warden. Dousing water on the molten iron to cool it may help to keep the fire from spreading, if it is safe to stay in the building until help arrives.

White-Phosphorus Bombs. In dealing with the fuming particles of white phosphorus released from exploded phosphorus bombs, it is essential to extinguish every particle. This may be done with water, but the particles will ignite spontaneously if they are allowed to dry out again. For that reason it is necesary to locate every particle while wet and dispose of it by burning.

A 5% or 10% solution of copper sulphate, if it is available, is an even better extinguisher than water. The copper sulphate reacts with the phosphorus to form a metallic coating over the particle and thus shuts out the air. When the phosphorus particles have become cool and solid they may be picked up and burned.

Apparent Duds. Bombs which do not start burning or explode upon impact may be "delayed-action" incendiary or high-explosive bombs. It is extremely dangerous to have anything to do with them. The premises should be vacated at once and the police or the air-raid warden notified. Trained crews and special equipment are needed for their removal.

ABOUT THE AUTHORS

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